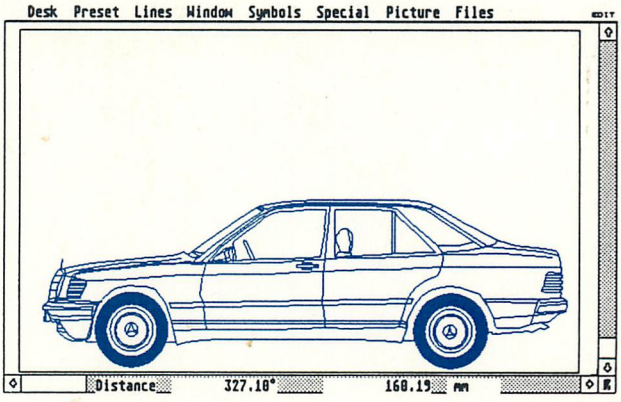
GFA Draft Plus



The Professional 2-Dimensional CAD Program

MichTron®

GFA DRAFT PLUS

Advanced Computer Drafting

for the Atari ST
and the IBM-PC

By GFA Systemtechnik

Reference Manual

Published by MichTron, Inc.

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Contents

Introduction 1

Chapter 1: Preliminaries 7
The Mouse 8
Choosing from a Menu 8
Starting the Operating System 9
Creating a Security Copy 10
Loading the Directory 12
Starting the Program 13
Files 13

Chapter 2: The GFA DRAFT PLUS Menu 21
The Cursor 25
The Picture and the Work Window 29
Positioning the Work Window 30
Drawing Lines 33
Text in the Drawing 41
Ending the Program 47

Chapter 3: Working With the Window 49

Chapter 4: Complex Graphics Functions 59

Chapter 5: Working With Symbols 82

Chapter 6: Delete Functions 89

Chapter 7: Functions for the Whole Picture 93
Working on Several Levels 100

Chapter 8: Commands 105

Chapter 9: Printing and Plotting 117

Chapter 10: Using a Ram Disk 129

Chapter 11: A Practice Example 133

Chapter 12: Summary Of The Functions 151

Appendix A: Error Messages 189

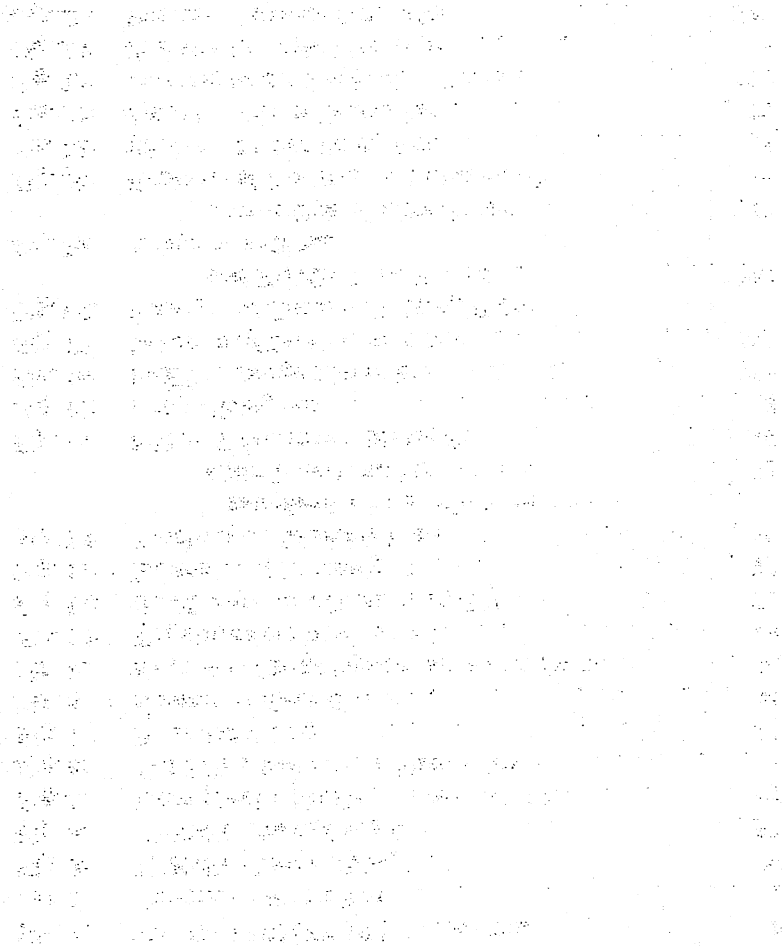
Appendix B: The Printer and the Plotter 193

Appendix C: The LIST Program 199

Index 205

List of Diagrams

Fig. 1: The GFA DRAFT *PLUS* Menu Bar 9
Fig. 2: The Item Selector Box 14
Fig. 3: *PRESET Cursor* Dialog Box 26
Fig. 4: *PRESET Lines* Dialog Box 37
Fig. 5: Example of Changing 2 Lines to 1 Line 40
Fig. 6: *PRESET Character Set* Dialog Box 42
Fig. 7: Directional Text 44
Fig. 8: Rotated, Reflected Text 44
Fig. 9: Example of Drawings Set up with a Frame 46
Fig. 10: The Directions of a Tangent 69
Fig. 11: *Hatch Angle and Distance* Dialog Box 71
Fig. 12: Examples of Hatching 73
Fig. 13: Hatching by Selecting Lines 75
Example of a Point of Intersection Calculated from Many Lines 75
Fig. 14: *PRESET Dimension* Dialog Box 77
Fig. 15: *Entry* Dialog Box 81
Fig. 16: *PRESET Image* Dialog Box 94
Fig. 17: *Selection of Levels* Dialog Box 101
Fig. 18: Example of Commands Using *Polar* and *Relative* Coordinates 108
Fig. 19: A Square with the Corner Points' Coordinates 111
Fig. 20: Example of Drawing with Commands 115
Fig. 21: *PRESET Plotter* Dialog Box 119
Fig. 22: *PRESET Printer* Dialog Box 120
Fig. 23: Printing Order For Larger Pictures 122
Fig. 24: Practice Example Picture #1 143
Fig. 25: Practice Example Picture #2 149



Introduction

The Improvements in DRAFT *PLUS*:

There are so many improvements in GFA DRAFT *PLUS* that they cannot all be listed here. Here is a list of the major changes, but the details can only be discovered by working with the program.

- All menus are now included in just one menu bar.
- Many individual parameter settings are now integrated into dialog fields. The most important settings are now stored with the picture data.
- It is now possible to print or plot selected segments of a drawing.
- Lines need no longer touch in order for you to hatch between them. One can, for example, hatch the space between two vectors.
- There are some new functions in GFA DRAFT *PLUS* (*Parallel, Tangent, Increase Lines, Entry*, etc.).
- It is now easier to manipulate a single pixel, making it easier to draw to scale.
- Individuals can create their own character sets, which can be manipulated like the standard character sets (character size, rotation, mirroring).

- The biggest improvement is that drawing can be done with commands, thus simplifying complicated drawing techniques.

- The commands can be read from a data file, which allows GFA DRAFT *PLUS* to import information from other programs. You could, for example, let GFA BASIC compute the vectors. The possibilities are unlimited!

What DRAFT *PLUS* Offers:

All functions of this program are chosen from menus using the mouse to add speed and efficiency. As the menu items are almost self-explanatory, a long training period is not required. It is possible to create symbols which can be used repeatedly as well as reflected, rotated, enlarged or reduced at any time.

Converting measurements to a particular scale is not necessary. Once the scale has been entered into the computer, the measurements are shown as they would be in reality. Text is simply added with the keyboard and can be rotated, reflected, enlarged or reduced. Two different types of hatching can be defined with different angles and spacings to create many interesting patterns. Objects can be excluded from the hatching.

As well as the usual functions, GFA DRAFT *PLUS* offers many possibilities not found in other graphics or drafting programs. These include the ability to draw circle and ellipse segments, rounded corners, arcs defined by three points, and lines at specific angles to others. The comprehensive

scaling functions spare the user from time consuming calculations. The program determines all lengths (according to the scale) and angles.

The handbook is divided into two main sections:

1. A detailed explanation of each function for the beginner, with a practice example.

2. A summary of each function for the impatient or experienced user.

Note: On the diskette is a file called READ.ME. This contains information which could not be included in this handbook. It may be worthwhile for you to view or print out the information.

Why Use a Computer to Draw or Design?

Most drawings in a specific field consist mainly of recurring elements. One thinks of resistors, transistors and IC's in electronics; valves, pumps and pipes in mechanical engineering and so on.

With GFA DRAFT *PLUS*, one has the opportunity to store these elements as symbols, and to use them over again and again. Unlike drawing on paper, you can experiment with new ideas, and change or discard them as you wish.

If you want to create a drawing that is similar to an existing one, you can copy the existing drawing and then simply modify it. Difficult and time consuming jobs can be carried out quickly and easily. Think of the time saved just in hatching, rounding corners, or placing arcs correctly! The

finished drawing can be printed, enlarged or reduced in size.

The ease and convenience of designing with a computer allows increased experimentation, versatility, and creativity, and allows you to produce the highest quality product possible. Designing with a computer clearly offers advantages that render conventional drafting methods obsolete!

Chapter One:

Preliminaries

The Mouse

The mouse is used to move the cursor around the screen. There are two buttons on top of the mouse: the left button is required most often for such things as selecting items and executing functions; the right button is used to terminate functions.

> *Note: The right mouse button does not react to a short click. Therefore, keep the button depressed until the function ends.*

"Clicking"

A short press on a mouse button is known as clicking. The location of the cursor is important when clicking. The mouse button is pressed twice in quick succession for "double clicking".

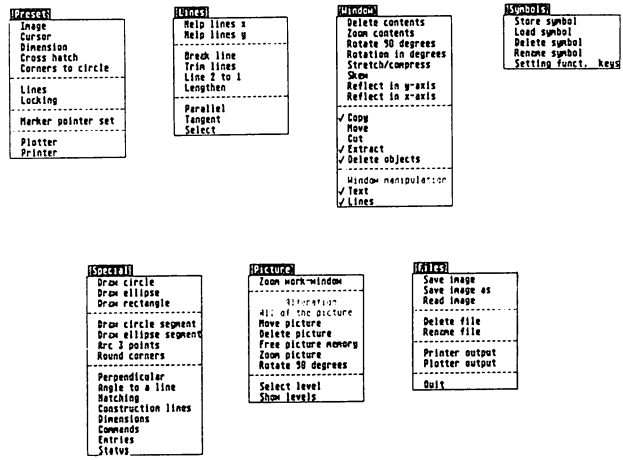
Choosing From a Menu

In the GEM Desktop (see page 9) used in GFA **DRAFT** *PLUS*, there are menu bars on the top edge of the screen which contain menu titles for functions such as *FILES, SYMBOLS*, etc.

When the cursor is moved to one of these menu titles, the menu "rolls down" and the individual menu items become visible. This type of menu is known as a "pull-down" menu.

When the cursor is on one of the items, it is displayed in the inverse shade. The function is executed by clicking the left mouse button.

Fig. 1



Starting the Operating System

Switch on the monitor, the disk drive and the computer. If the operating system is not in ROM, a screen will appear that asks for the system diskette to be loaded. When you have done this, move the cursor with the mouse to the OK field and click it once with the left mouse button. In this case, the RETURN key can be used instead of clicking the mouse.

After a short time, the operating system shows you two diskette icons as "drawers", the trash basket and the top line with the menu bar. This picture is the "GEM Desktop". It is the starting point for all GFA DRAFT *PLUS* activities.

Creating a Security Copy

Before you use GFA DRAFT *PLUS* for the first time, you should make a security copy of the diskette and store the original in a safe place. The GFA DRAFT *PLUS* diskette is not copy-protected to allow you to make a security copy. We would, however, request that the buyer not give the program to third parties, for only with the user's integrity will it be possible to bring high quality software into the marketplace at a reasonable price in the future.

After the operating system has been loaded, remove the system diskette and place a new, blank diskette in the drive. Formatting is necessary so that the computer can organize the space on the diskette into regions which it can address.

Move the cursor onto the picture of the Drive A icon and click once with the left mouse button. This disk drive has now been chosen and is shown in black. Now go to *FILE* in the menu bar on the GEM Desktop and then to the menu item *Format* and click it once with the left mouse button.

If the menu item does not respond, the proper disk drive has not been selected. The warning field that appears will inform you that formatting deletes the contents of the diskette. This warning is to remind you to make certain that you are not destroying valuable data. After clicking the OK field, a dialog field containing the word Formatting appears.

Now you should enter a valid diskette name on the keyboard, for example: DRAFT.1. If you have the

floppy drive SF354, make sure that you have chosen the field ONE SIDED (the shade is inverted) and then click the FORMAT field to start the formatting. After a while, the FORMAT field appears once again on the screen. Clicking the EXIT field returns you to the GEM Desktop. The diskette is now formatted and ready to store data.

Copying the GFA DRAFT PLUS Diskette:

First you should make sure that the original GFA DRAFT *PLUS* diskette is write-protected so that nothing can happen to it if anything should go wrong with the copying. On one edge of the diskette there is a hole through the disk with a slide cover. This cover must be pushed back so that the notch is open. In this state, the diskette can only be read and not written on or deleted.

You cannot store drawings from GFA DRAFT *PLUS* on a write-protected diskette, therefore it makes sense to work with the copy. Put the original GFA DRAFT *PLUS* diskette in the drive. Move the cursor to the Disk Drive A icon. Press and hold the left mouse button down. If you now move the cursor, the symbol for Disk Drive A moves with it. Move the symbol to exactly cover the symbol for Disk Drive B and release the left mouse button. A warning appears to inform you that if diskette A (the GFA DRAFT *PLUS* diskette) is copied onto diskette B (the new diskette) the information presently on diskette B will be lost. Click the OK field to continue. The words Diskette Copy then appear. Click the COPY field and follow the subsequent instructions which require you to exchange the diskettes.

As soon as the copying is completed the words Diskette Copy reappear on the screen. Click the EXIT field to return to the GEM Desktop. Copying is much easier if you have two disk drives and is not described here. See the *Atari ST* handbook for further details.

Loading the Directory:

Place the GFA DRAFT *PLUS* diskette in Drive A. Move the cursor onto the icon for Disk Drive A and click the left mouse button twice to display the directory of the GFA DRAFT *PLUS* diskette. If the interval between the two clicks was too long, the symbol will appear black. If this happens you can go to the *FILE* menu and choose the item OPEN, which will display the directory. If you discover that the wrong diskette has been inserted, simply remove it and place the correct diskette in the drive and press the ESC(ape) key. The directory will be loaded again. If you should happen to pull down a menu by mistake, move the cursor outside the menu and click the left mouse button. The menu will then roll-up without anything happening. The directory with the various icons should now be displayed.

There are three types of files:

1. Program files which contain a runable program.

2. Files without programs in which drawings (from GFA DRAFT *PLUS*) or texts from a text program are stored.

3. Groups in which several files or programs can be collected in order to maintain an overview of the directory.

Starting the Program

Among the program files is the DRAFT.PRG. Start this program by clicking it twice with the left mouse button, or by clicking it once and then going to the *FILE* menu and clicking on OPEN. You are now in the function *Read Image*.

Files

When a picture is being worked on, it is in the work area of memory which is lost after the program has finished or the computer has been switched off. Therefore, pictures are stored on diskette, each in a file of its own. The file name consists of up to 8 alphanumeric characters, a dot and the extension. The extension is a three-digit number, in normal cases just 000. When working with multi-layered pictures this can be a number between 001 and 999. This will be discussed in detail later.

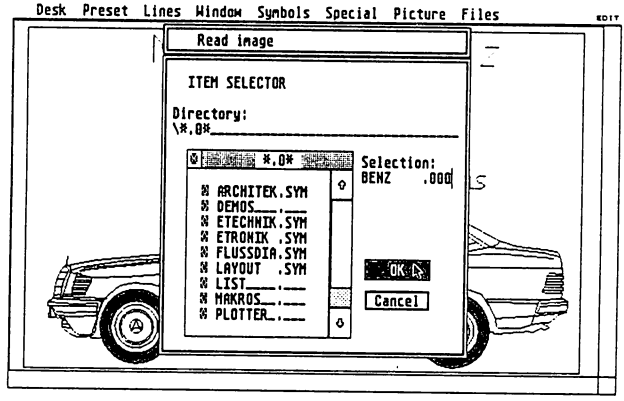
Read Image

The program begins in this function. It can later be chosen from the menu. *Read Image* causes a previously stored picture to be read from the diskette and brought into memory so that it can be worked on.

Menu: **Files**
Menu Item: **Read Image**

An option box appears from which you can choose the picture you wish to read.

Fig. 2



The option box consists of three areas:

a) Directory Line:

This line contains a mask which preselects the files that are to be shown in the directory window. When you want to read a picture simply select it from the directory. In the *Read Picture* function, this field contains: A:*,.0*

A:\ Files from Drive A.

* Any characters in any combination can be present.

.0* All files containing .0 somewhere in their names will be shown. In practice, this means that files with the extensions .000 thru .099 are selected.

b) Directory Window

This shows the names of the files which meet the conditions of the directory line. If there are so many files on the diskette that they do not all fit in the directory window you can scroll the list with the scroll bar. The scroll bar is the vertical, shaded area to the right of the file names in the directory window. It has an arrow boxes at each ends. If the cursor is put onto one of these arrow boxes, the window moves one line.

The scroll bar has an unshaded part, the pointer. The full scroll bar represents the complete list of files. The pointer shows the position of the directory window within this list. If the cursor is placed on the pointer and the left mouse button held down, the pointer can be moved. If the button is

released, the pointer is set at a new location. If the left mouse button is clicked with the cursor in the shaded area of the directory window above the pointer, it scrolls the page upward; if it is below the pointer, it scrolls downward. If a file name in the directory window is clicked, it is copied into the input line.

c) Input Line

The file which is shown here will be read in by the computer after clicking the OK box. The entry in the input line can be erased completely by pressing the ESC(ape) key, or erased a character at a time by pressing the BACKSPACE key. The required file name can be typed in directly using the keyboard.

If you want to create a new file, simply type its name into the input line and click the OK box (remember to think about the extension!). If another picture is present in memory and has not yet been saved at the time you choose *Read Image*, the question will appear:

Saving Current File OK/ABORT

OK: The picture that is currently in memory is stored before the new picture is read.

ABORT: The picture that is currently in memory is "thrown away" and the new picture is read immediately.

Note: Clicking the OK box can be omitted if the file name is double clicked in the directory window. If you want to read a picture from another diskette, place the diskette in the drive and click the area above the directory window. This causes the directory to be loaded again.

Note: When starting a new drawing you must enter a new file name. The program does not allow work on untitled drawings.

The path of the directory line can also be changed to select a different disk drive.

Just move the cursor to the directory line and click the left mouse button. You may now enter the desired path (like A:*.*, which would give you all files from Drive A:). If you now click on the top bar, all the files that belong to that path will be displayed in the dialog window. You can also use the cursor to move to the desired position.

The left and the right cursor arrows allow you to move within the current field; the up and down cursor arrows select the previous or next field.

Saving A Picture

The picture currently being processed will be stored under the name with which it was read in. To store a picture, click the following item with the left mouse button:

Menu: Files
Menu Item: Save Image

It is recommended to save the picture often when working on complex diagrams. Then if there is a power outage you will have the picture as it was last stored. If no changes have been made it will not need to be saved again.

The computer will automatically create a backup file with the extension .BAK whenever a file is saved. This makes it possible to recover the previous file in case the current file gets corrupted. This backup file can be selected by changing the directory line to match the file in the File Select box.

Save Image As

This function allows you to save the current picture under a different file name than the one it was loaded with.

Menu: **Files**
Menu Item: **Save Image As**

A dialog box will appear and the current file name will be displayed in the input line. Type in the new name and press RETURN.

> *Note: Selecting the item* Save Image *at a later time will cause the file to be saved under the original name.*

Deleting a File:

If you want to delete a file that is no longer required to make room on the diskette, click the following item with the left mouse button:

Menu: Files
Menu Item: Delete File

An option box appears in which you can click the name of the file to be deleted. After clicking the OK box, a second dialog box will appear. Clicking OK again will cause the file to be deleted. If you click ABORT no action will be taken.

Renaming A File

If you want to give a picture file a new name, click the following item:

Menu: Files
Menu Item: Rename File

From the option box you can click the file to be renamed.

After starting the program, you will be in the *Read Image* function. If your files are on a different diskette than the GFA DRAFT *PLUS* program, change diskettes and click the horizontal area above the directory window to load the directory of the new diskette.

Chapter 2:

The GFA DRAFT *PLUS* Menu

The GFA DRAFT *PLUS* Menu

You may select the following menus from the GFA DRAFT *PLUS* menu bar:

Preset Lines Window Symbols
Special Picture Files

Selecting a Menu Item

Choosing a menu item is always as follows:

- Move the cursor to the appropriate menu. The menu will "roll down".
- Move the cursor to the required item.
- Click once with the left mouse button.

If you want to close a menu without performing anything, move the cursor outside the menu and click once with the left mouse button.

Switching Menu Items ON/OFF

Some menu items are simply switches to be set on or off. If an item is switched on (the function is active) there will be a check mark before the item. Each click of this item switches the state of the function.

Dialog Fields

On some functions the computer must be supplied with certain parameters (for example, *Hatching: Angle, Distance, Type*). To accomplish this task, some menu items will produce a dialog screen.

There are two ways to enter values using dialog fields:

1. **Clicking Boxes**: These boxes contain values or symbols that are activated by moving to the cursor to that box and then clicking the left mouse button. The corresponding box is then inverted (shown in dark).

2. **Input Fields**: You can add numeric values to these using your keyboard.

After selecting the *Hatching* item from the *PRESET* menu, a dialog box that contains a field showing both of the input possibilities will be shown on your screen. Two boxes with symbols are shown that display the kind of hatching (*Simple* or *Double*). The box that is highlighted is the one that will be used for the hatching. If you wish to change it, just click the other box.

This dialog box also contains four input fields that require input from the keyboard. This input should be as follows:

One of those four fields will contain a vertical line. Values may only be added to that field. If you are satisfied with the entry already shown in that field, no changes need to be made. But if the value is not correct, it must be deleted and the new entry typed in. There are two ways of deleting the entry:

1. The ESC(ape) Key deletes the entry completely

2. The BACKSPACE Key deletes the entry one character at a time.

You only have to supply enough information in those fields for the computer to be able to recognize the meaning (like 2 for 2.0 or .5 for 0.5). These fields do not have to be completely filled. The vertical line must be moved to the other three fields for more input. There are two possible ways of doing this:

1. Press the UP or DOWN cursor key to move to the previous or next field.

2. Move the mouse pointer to the field and click the left mouse button.

The input will always be checked for legal values. If the value that was entered was not within the legal limit, the input will be rejected by the computer.

All dialog boxes contain an OK and a CANCEL box. The input values will be accepted when the OK box is clicked. CANCEL will exit the dialog box without making any changes.

The Mode Display

With more complex functions, the use of the mouse buttons is dependent upon the function selected. As an aid, the mode in which the program is operating is displayed to the right of the menu bar. A shortened form of the name of the function is shown here; if no function is active, this field will contain the word EDIT. Clicking the right mouse button will return you to the EDIT mode and terminate the current function.

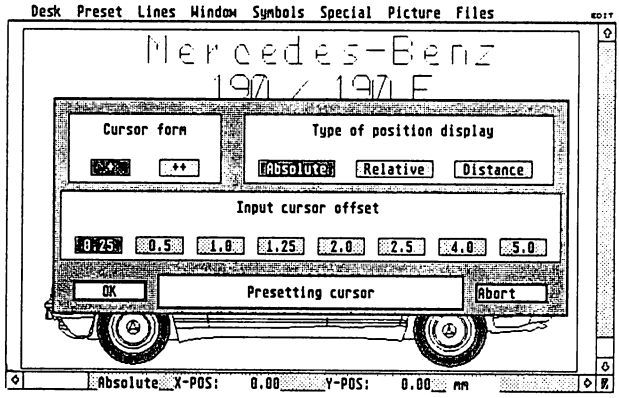
The Cursor

If you select this option a dialog box will be displayed which contains different cursor parameter options.

Menu: Preset
Menu Item: Cursor

This dialog box allows you to change the cursor form, the coordinate type and the *Mouse Raster*.

Fig. 3



Cursor Form

You can choose between two forms of cursor: A crosswire which stretches across the complete screen, or a small cross.

The crosswire cursor is advantageous when you want to draw an object at exactly the same height as another object on the screen, or when you want to draw a perpendicular line.

If the cursor is moved to a region outside the drawing area, it becomes an arrow with which you can choose menus.

Coordinates

The position of the center of the cursor can be read from the coordinates which can be seen in the work window. The origin of the coordinates (where X and Y are both zero) is the bottom left corner of the picture.

The default setting for the coordinate type is *Absolute*. The coordinates of the cursor are based on the whole screen. However, there exists two other possibilities: *Relative* and *Distance*.

Relative coordinates: Clicking the left mouse button sets the new origin at the current X and Y position. All future cursor positions are relative to this new origin.

Distance coordinates: This mode also sets a new origin at the current coordinate position by clicking the left mouse button. The left indicator shows the angle of the cursor and the right indicator shows the distance from this new origin. If the cursor is positioned exactly horizontal and on the right side of the origin then the angle is 0 degrees. The angle increases counter-clockwise.

The Mouse Raster (the Input Cursor Offset)

The *Mouse Raster* setting is the smallest increment that the cursor can move when using the mouse. This dialog field contains eight values for setting the *Mouse Raster*. The default value is 0.25 which means that the cursor can be moved in the smallest possible increment.

It is usually not necessary to be able to reach every point on the screen with the mouse. Sometimes it is easier if the positions that are not used can be skipped. This makes it simpler to position the cursor to scale. The following values can be selected for the *Mouse Raster*:

0.25 0.5 1.25 2 2.5 4 5

A value of 0.25 allows you to move in the smallest increment (a pixel).

> *Note: It is usually best to select the proper value at the start of the drawing or some points may be impossible to reach with the cursor if they fall in between the increments (although you can always change the Mouse Raster to reach them).*

Moving the Cursor

There are three ways of moving the cursor:

With the Mouse: The steps (increments) are dependent on the *Mouse Raster*.

With the Cursor Keys: If you press a cursor key the cursor moves the smallest possible step in the direction shown on the cursor key. The cursor moves in the smallest possible steps, even if the *Mouse Raster* is greater.

With the ALTERNATE/Cursor Key: If the ALTERNATE key and a cursor key are pressed together, the cursor moves in steps that are eight times the smallest possible step (a pixel).

Note: Sometimes it is inconvenient to use the mouse when the mouse buttons are required, so the mouse buttons have equivalents on the keyboard:

ALTERNATE/Insert key = left mouse button
ALTERNATE/Clr-Home key = right mouse button

The Picture and the Work Window

An area of 1318 x 1318 mm (51 x 51 inches, 4.3x 4.3 feet) is available for drawing. This will be referred to from now on as the "picture". Only a small part of this can fit on the screen. The portion that you see on the screen is, in the basic setting, 88mm high (Y direction) and 153 mm wide (X direction). The portion of the picture shown on the screen is called the "work window".

Zooming the Picture

The size of the portion of the picture shown in the work window can be changed. A small area in the work window is useful when working on fine detail and a larger area when drawing lines which run over large parts of the picture. To change the amount of picture in the work window the following item must be clicked:

Menu: Picture
Menu Item: Zoom Work Window

A dialog field appears in which you can select the size of the work window as compared with the drawing. 8:1 indicates a work window eight times as large as in the basic drawing.

8:1 The work window is 1228 mm x 700 mm
4:1
2:1
1:1 (The default) The work window is 153 mm x 88 mm
1:2
1:4
1:8 The work window is 25.5 mm x 11 mm

Zooming does not affect the contents of the picture. The measurements shown on the coordinate axis are also not affected (when you use a zoom lens to look at an object the dimensions of the object do not change).

The step size used by the cursor while using the mouse depends on the zooming factor.

Example: Scale 1:1, *Mouse Raster* 1.0

Work Window	Step Size
4:1	4 mm
1:1	1 mm
1:4	0.25 mm

It is possible to reach the positions between the increments with this zooming option.

Positioning the Work Window

Since the complete picture is much bigger than the work window, you are able to alter the position of the work window. At the bottom and to the right of the work window are two shaded areas which are called the "scroll bars". Each scroll bar has a "pointer" (the white, unshaded area).

The length of the horizontal scroll bar represents the total width of the picture; the pointer shows the position of the work window relative to the total width of the picture.

The height of the vertical scroll bar represents the total height of the picture, and the pointer shows the position of the work window relative to the total height of the picture.

> *Note: The size of the scroll bars depends on the zooming factor. If a large part of the picture is contained in the work window (8:1) then the scroll bars are also very large.*

With the Pointer

The pointer not only shows the position of the work window but can also be used to change its position. To do this, put the cursor on one of the pointers, press the left mouse button and hold it down. If the mouse is now moved, the pointer will move with it. When the mouse button is released, the pointer is fixed at its new location and the work window is moved to this position.

Note: Depending on the complexity of the drawing, it may take a while for the work window to be moved to the new position.

Try this a few times with the vertical and horizontal pointers and watch what happens to the position indicators. If the horizontal pointer is as far right and the vertical pointer is as high as they will go, the work window will be in the top right-hand corner of the picture. The position indicators should now show coordinates around 1300 (if the coordinate type is *Absolute*).

Clicking in the Scroll Bars

The second way to change the position of the work window is to click inside the shaded areas of the scroll bars. This causes the work window to move by exactly one screen width (or height).

The direction in which it moves depends on which area is clicked. On the horizontal bar, a click to the right of the pointer moves the work window to the right, a click in the area to the left of the pointer moves the work window to the left. On the vertical bar, a click above the pointer moves the work window up and a click below the pointer moves it down.

Using the Arrow Boxes

If one of the boxes at the ends of the scroll bars is clicked, the picture moves a short distance in the direction of the arrow.

Using the Cursor

The fourth way to move the work window is with the cursor. This is done by moving the crosswire cursor to any point within the work window and double clicking the left mouse button. The position of the cursor becomes the center of the new work window.

For example, if the cursor is in the top right corner when double clicked, the work window will move upward to the right.

If the interval between the two clicks was too long you may find a line hanging from the cursor. Simply click the right mouse button to remove this.

Try each of the above ways to move the work window and, while doing so, watch the coordinates.

> *Note: The double click interval can be changed by using the Desktop Control accessory. A setting of 2 is usually appropriate.*

Drawing Lines

The first point of a line is set by clicking the left mouse button. A line will now hang from the cursor and move with the cursor until it is in the correct position. Another click of the left mouse button will fix this line in its current position.

After fixing the line in place, a new line is attached to the cursor and the process can be repeated.

If no more lines are required, clicking the right mouse button removes the "elastic" line from the cursor. A horizontal or vertical line can easily be drawn by placing the line so that it exactly covers one of the crosswires. Try to draw lines of a specific length to become accustomed to the coordinates. For horizontal or vertical lines the length is the difference in the coordinates between the start and end points.

If there are many lines to be drawn to scale, the *Relative* or *Distance* coordinates can be very useful in saving time since the distance does not have to be calculated. With *Distance* coordinates, the length of the line is shown even if that line is not horizontal or vertical.

You may find it difficult to position a line exactly to the millimeter with the mouse. This can be done easily if you use the ALTERNATE/ SHIFT/ Cursor key on the keyboard. It is practical to use the ALTERNATE/INSERT and ALTERNATE/ CLR-Home keys for the left and right mouse buttons together with this.

It is also practical not to set the *Mouse Raster* to the smallest position, which would make the drawing of horizontal and vertical lines more difficult.

Freehand Drawing

You are not confined to drawing only straight lines with the cursor. If you click the left mouse button once and then hold the left mouse button down a line can be traced out by moving the cursor. This function is ended by clicking the right mouse button.

Locking Lines

If two lines are supposed to meet at one point, it is sometimes difficult to place the end of one line exactly on the end of the other. Sometimes it may look as though this has been done successfully, but when the object is enlarged it can be seen that the two lines do not exactly join or that one line overhangs slightly.

There is a function to prevent this which locks the ends of the lines together:

Menu: Preset
Menu Item: Locking

If this function is switched on and you want to position the end of a line, the program looks for the end of another vector within a certain radius of the cursor. If found, it locks the new line onto this point even if the cursor is not exactly on it.

For normal hatching, which is discussed in more detail later, it is important that the lines be locked. The radius to which the vector is locked can be changed as follows:

Menu: Preset
Menu Item: Image

The dialog now shows a field that will accept a value of 0.5 to 99 mm for the radius. Other settings that are not mentioned here are discussed later.

Shortening or Increasing Lines

To change the size of an already existing line, it is not necessary to delete the line and then to redraw it. The following selection accomplishes this task:

Menu: Lines
Menu Item: Lengthen

After this function is selected, move the cursor to the line that needs to be changed and then push the left mouse button. The line is now shown as a dotted line. You can now change the length by holding down the left button while moving the mouse. Once the desired length is reached, release the button and click it.

Repeat this process as often as you like. To terminate this function, click the right mouse button. The mode indicator will return to EDIT.

Example: This function may be used in a drawing of a switch to connect the electrical symbols to the wires.

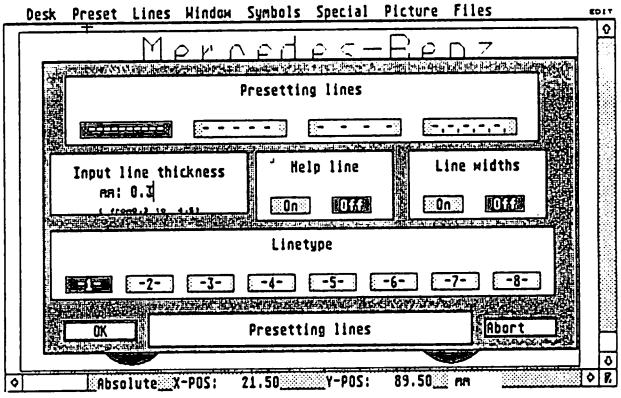
Presetting Lines

The line type, line thickness and line kind may be changed in a dialog field by selecting the following function:

Menu: Preset
Menu Item: Lines

All new lines are drawn with these values after clicking the OK box.

Fig. 4



Line Types

A dialog field appears with the list of line types:

1. Solid Line
2. Short Dashes
3. Long Dashes
4. Dotted Line

The currently selected line type is darkened. Move the cursor onto the desired type and click once with the left mouse button. From now on, all the lines will be drawn in this type (this includes the lines used for hatching).

Line Thickness

The thickness of a line can be set in 0.3 mm steps between 0.3 and 4.5 mm. Use the ESC or BACKSPACE key to delete the existing value and type in the desired value over the keyboard.

> ***Note:*** *The thickness only applies to solid lines, not to dashed or dotted lines.*

Display in Actual Thickness

In order to maintain clarity it is sometimes useful to not see the lines in their actual thicknesses, but in the thinnest format (0.3 mm). The computer draws the picture more quickly if the smallest line thickness is used.

If the *Line Thickness* is active (ON is highlighted in the *Preset Lines* dialog), all lines will be shown with their actual thicknesses. If the function is inactive, all lines will be shown as thin, although their actual thickness is stored and can be called up at any time.

Line Kind

All the lines that are drawn have an internal line kind. This allows you to separate the vector values by line kind like electrical lines with Line Kind 1 and hydraulic lines with Line Kind 2. Select box 1 to 8 to see what the line kind looks like.

Break Line

With this function, two lines which cross at a point are separated. After this, the computer treats them as four separate lines which can be manipulated or deleted in the same way as other lines.

Menu: Lines
Menu Item: Break Line

After selecting this item, click two lines which cross at a point with the left mouse button. The function can be repeated until it is ended by clicking the right mouse button.

Line 2 to 1

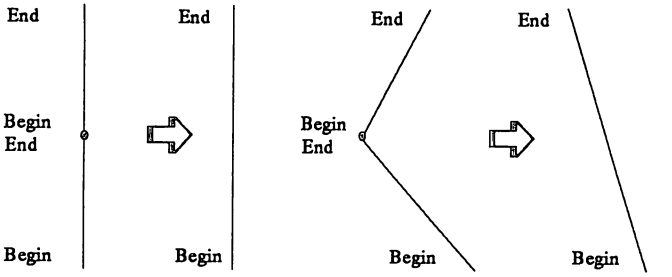
This selection performs the opposite of the *Break Line* function. Two lines are combined into one line.

Menu: Lines
Menu Item: Line 2 to 1

The two lines must actually touch for this function to work. Click both lines and the two lines will be combined.

If the two lines have different angles than a new line between both end points is drawn.

Fig. 5: Example of Changing 2 Lines to 1 Line



Trim Lines

This function is used to trim lines that overhang past the point where they cross.

Menu: Lines
Menu Item: Trim Lines

After selecting this item, you must click the left mouse button on two lines which cross at a point. The ends of the lines will be trimmed on the side that has been clicked. The function can be repeated until it is ended by clicking the right mouse button.

Text In the Drawing

When preparing a drawing, you may want to label items or to give it a title. To do this, move the cursor to the place where the text is to start.

> *Note: The file called* ASCII *on the* GFA DRAFT PLUS *diskette is used by the program for this function.*

Now simply type in your text over the keyboard. If you make a mistake, you can use the BACKSPACE and DELETE keys to correct your entry.

The text begins at the vertical crosswire and lies on the horizontal crosswire. To write a second line of text exactly under the first, line up the vertical crosswire with the beginning of the first character of the first line. It is easier to place the text at the same height or at the same starting position if a bigger *Mouse Raster* is used.

> *Note: The combination of the Control-A to Control-N keys corresponds to the ASCII values of 224-239.*

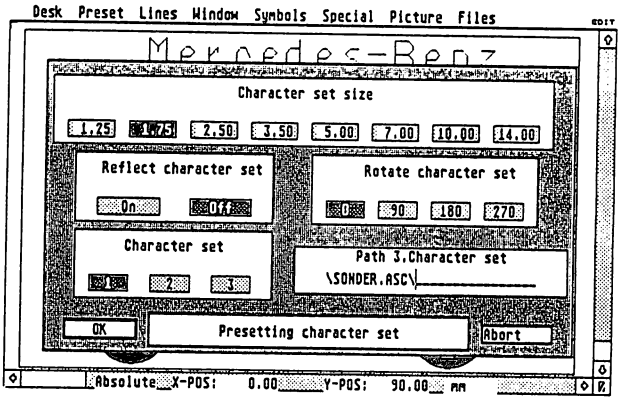
Preset Marker Pointer Set

All character settings can be set using the following dialog:

Menu: Preset
Menu Item: Marker Pointer Set

All settings become active when the OK box is clicked.

Fig. 6



Size of Characters:

The dialog box displays eight values in the *Character Set Size* section. All sizes are shown in millimeters and they represent the height of the character. The following sizes may be selected by clicking the one desired:

1.25 1.75 2.5 3.5 5.0 7.0 10.0 14.0

Reflecting Text:

It is sometimes necessary to write reflected text on a drawing (for example, when designing circuit boards).

This is made possible by activating the ON box in the *Reflect Text* dialog. After this item has been activated, all text is reflected. This continues until the item is deactivated. To make clearer the directions of the text and the position of the text relative to the cursor lines, look at the figures below.

Setting the Direction of the Text:

The dialog box shows four possibilities for character orientation in the *Rotate Character Set* section:

0 degrees	Normal text, basic setting.
90 degrees	The text is read from the right.
180 degrees	The text is vertical and read from the top.
270 degrees	The text is read from the left.

After one of these settings has been clicked, all text is written in this direction.

The following figures show the four alternatives. Note the directions and the position of the text relative to the cursor lines.

Fig. 7: Directional Text

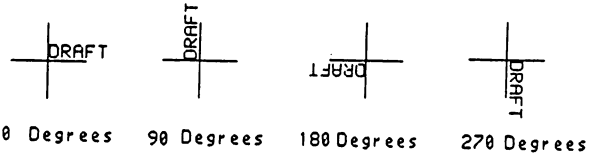
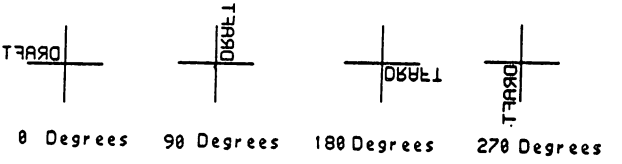


Fig. 8: Rotated, Reflected Text



Character Sets

Three character sets are available for the text.

Character Set 1: *Normal Text*
Character Set 2: *Boldface*

Character Set 3: *Custom*

The third character set allows you to design your own character sets. This not only makes it possible to create new alphabetic characters but also to select symbols by merely touching a key on the keyboard. For example, you can define the R key to be used for the Resistance symbol and the C key for the Capacitance symbol.

The *PRESET Marker Pointer Set* dialog box contains a field with the name of *Path 3 Character Set.* This field allows you to input the drive and the folder from which the third character set is to be loaded from. The default name SONDER.ASC means that whenever a key is pressed a character is loaded from this folder.

The characters of these character sets are normal symbols and are discussed in more detail later in this manual. These symbols must contain the name of the letter as follows:

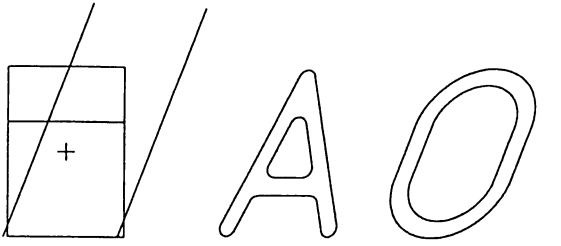
A.SYM for the letter A
A_.SYM for the small letter a

When creating these symbols, one must be careful to make sure that the distances and heights between characters is always the same; otherwise, the characters cannot put on an even line.

When creating your own symbols, it is best to draw a frame and then fit the symbols within that frame.

A tip: The character sizes can be changed by changing the last eight values in the file GFADRAFT.INS.

Fig. 9: Example of Drawings Set Up Using a Frame



Ending the Program

To end the program select the following:

Menu: Files
Menu Item: Quit

The following options are available:

OK: Before ending the program the picture is stored under the name with which it was read.

CANCEL: The program ends without storing the current picture. The contents of the work area are lost.

> *Note: These options are also displayed with both the* Save Image *and the* Save Image As *menu items.*

Chapter 3:

Working With The Window

The Window

If you want to change something in a picture (delete, move, enlarge, etc.), you must identify the object to be changed. The following functions work with "windows" (not to be confused with the "work window"). With these windows, objects in the picture are "framed" and, in this way, the computer recognizes that something is to be done to them.

A window is drawn by placing the cursor in the top left corner of the area you wish to modify and holding the left mouse button down. When the mouse is now moved to the bottom right corner of the area to be changed a dashed-line window is "pulled out". The position of this window can be adjusted as long as the left mouse button is held down, but as soon as the left mouse button is released the window is fixed into position. The contents of the window can now be copied, moved, or another function can be selected via the *WINDOW* menu.

If nothing has been done to the contents, the window can be deleted at any time without effecting the contents by clicking the right mouse button.

Window Manipulation

When working with windows in an already complex picture, it can be difficult to frame only those elements that are to be changed. Therefore, the option exists to make window functions apply only to certain types of elements. These two types of elements are:

a) Lines or Vectors: Everything drawn by *GFA DRAFT PLUS* consists of vectors. A line is one vector, a square consists of four vectors, a circle consists of many vectors.

b) Text: Characters typed in with the keyboard.

These two types can be included or excluded from window functions.

Menu: Window
Menu Item: Text

If this item is selected, the window operations apply to any text that is in the window; otherwise, it is ignored.

Menu: Window
Menu Item: Lines

If this item is selected, the window operations apply to any lines that are in the window; otherwise, they are ignored. The two menu items can both be selected. In this case, the window functions apply to everything in the window.

Determining Which Lines are in the Window

Whether or not a vector that does not lie entirely within the window will be affected by the window function depends on the following settings:

Menu: **Window**
Menu Item: **Extract**
or
Menu Item: **Cut**

If the *Extract* option has been selected, only vectors which lie completely inside the window are modified.

If the *Cut* option has been selected, vectors which continue outside the window are cut at this point and the part inside the window is modified by the function. The part outside the window remains unchanged.

The *Extract* and *Cut* settings are mutually exclusive — if one option is selected the other is automatically switched off.

Closing the Window

After changing the contents of the window, you have two possibilities:

- You can accept the changed window by clicking the left mouse button.
- You can reject the changed window by clicking the right mouse button so that the window disappears.

Copying the Window

To copy a window that already exists, select the following item:

Menu: Window
Menu Item: Copy

Hold down the left mouse button. The window will stick to the cursor and can be moved to a new location. Release the left mouse button to fix its position. The new window can be closed as described above.

The contents of the original window will remain unchanged.

Moving the Window

To move the contents of the window, select the following item:

Menu: Window
Menu Item: Move

The procedure is the same as for copying a window, but the contents of the original window are moved.

The settings for *Move* and *Copy* are mutually exclusive — if one is selected the other is automatically switched off.

WARNING: *If you click the right mouse button (to ignore the changes) when closing the window, the contents of the window will be lost because, unlike when copying, the original window no longer exists.*

To copy or move a window the mouse button does not have to be held down. If the cursor is moved to the new location and the left mouse button is clicked, the window jumps to its new position.

Delete Window Contents

Menu: **Window**
Menu Item: **Delete Contents**

Clicking this item deletes the contents of the window.

Zoom Window Contents:

The contents of the window can be zoomed by a factor between 0.01 and 10.0. The factor 0.1 reduces the object to a tenth of its original size. A factor of 2.0 will enlarge the object to double its original size.

Menu: **Window**
Menu Item: **Zoom Contents**

In the dialogue field the old zoom factor must be deleted by pressing the ESC key and a new factor entered. After clicking the OK box the new factor is applied.

WARNING: *Try to avoid reducing an object and then enlarging it again. When reducing an object the program must, to a certain extent, round the values of the dimensions that define the object. On subsequent enlarging the rounding becomes apparent as a certain lack of precision in the object. The same applies for zooming the whole picture, which will be covered later.*

Rotate the Contents of a Window

Menu: Window
Menu Item: Rotation in Degrees

The above item must be clicked to rotate the contents of the window. Enter an angle between 0 and 360 degrees in the dialogue field with the keyboard. A negative value indicates clockwise rotation.

Rotate the Contents of a Window 90 Degrees

The most common angle of rotation required is 90 degrees. This is available as a separate menu item to avoid having to enter the angle repeatedly.

Menu: Window
Menu Item: Rotate 90 Degrees

Reflect the Window Contents

The contents of the window can be reflected on either the X or Y axis.

Menu: Window
Menu Item: Reflect on X axis
or
Menu Item: Reflect on Y axis

Stretch/Compress Window Contents

Menu: Window
Menu Item: Stretch/Compress

With this function, you can change the size of an object inside the window. The origin is the top left corner of the window. Moving the cursor towards this point reduces the object and moving the cursor away from this point enlarges the object.

Skew Window Contents

Menu: Window
Menu Item: Skew

If this item is chosen the object in the window can be skewed horizontally. The bottom of the object remains stationary and the rest can be skewed sideways, to the left, or to the right. If a square is skewed the result is a rhombus.

> *Note:* Stretch/Compress *and* Skew *functions do not affect ASCII characters. Only the spacing between the characters is changed.*

A tip: If you want to skew an object vertically, first rotate the window 90 degrees then apply the skew function and rotate the window back to its original position.

Window Operation with Selected Lines

If you wish to work only on selected lines within the window, it is sometimes hard to extract the desired lines. There is another possibility:

Menu: Lines
Menu Item: Select

When this option is activated, it is possible to select single lines with the cursor. Clicking the line twice will cause a window to be drawn around that line. You can now use the normal window functions to modify that selected line.

The window functions only work on the selected lines and not on objects that happen to lie within the same window.

This function is also used for *Hatching*, which is discussed in Chapter 4.

Chapter 4:

Complex Graphics Functions

Complex Graphics Functions

Apart from the standard functions to draw circles, ellipses, squares, etc., GFA DRAFT *PLUS* has many functions not found in other graphics programs. These include circle and ellipse segments defined by three points and, something that saves a lot of time, the rounding of corners.

The process when working with these functions is always as follows:

1. Some functions can be preset.
2. Selection of the menu item.
3. The subsequent use of the mouse as related to the function.
4. The function can then be repeated until the right mouse button is clicked.

The current function is shown in the mode display. Preset items can only be set in the *EDIT* mode.

> *Note: If you are in one of the following modes, you cannot choose anything from the menus. The mode must first be ended by clicking the right mouse button.*

Drawing a Rectangle

Menu: Special
Menu Item: Draw Rectangle

After this has been chosen, move the cursor to where the top left corner of the rectangle is to be. Press the left mouse button and hold it down. If the cursor is moved down and to the right a rectangle is formed between the starting point and the cursor. When the rectangle has the correct dimensions, release the left mouse button.

If the rectangle is not in the correct position, press and hold the left mouse button again. The rectangle will stick to the cursor and can be moved to the correct position.

If the rectangle is correctly placed, it can be fixed into position by clicking on the left mouse button. If the rectangle is not to be included in the drawing, click the right mouse button to delete it.

Drawing Circles and Ellipses

Circles and ellipses are drawn in almost the same way.

Menu: Special
Menu Item: Draw Circle
or
Menu Item: Draw Ellipse

First, select one of the above items, and then move the cursor to the point where the center of the circle or ellipse is to be. Press the left mouse button and hold it down.

If the cursor is now moved downwards and to the right, a window is formed containing a circle or ellipse.

If the *Draw Ellipse* function has been chosen, the form of the ellipse can be defined as follows:

- Moving the cursor to the right stretches the ellipse horizontally.

- Moving the cursor downwards stretches the ellipse vertically.

When the ellipse has the correct form (or the circle has the correct diameter) release the left mouse button.

If the circle or ellipse has to be moved to another location, hold down the left mouse button again. The window sticks to the cursor and can be moved until the left mouse button is released. Click the left mouse button to fix it into position.

If the circle or ellipse is not desired, click the right mouse button to delete it.

If you wish to draw a circle with a given radius, you must set the coordinates to *Distance*.

Note: If the position indicator is set to show Relative *coordinates, the Y coordinate shows the height of the ellipse from the center and the X coordinate shows the width of the ellipse from the center. If you are drawing a circle, the X and Y coordinates are identical and show the radius of the circle.*

Note: If the PRESET *function* Locking *is set, you can draw the lines so that they touch the circle or the ellipse.*

Drawing Circle and Ellipse Segments

Usually only a part of a circle or ellipse is required in a drawing.

Menu:	Special
Menu Item:	Draw Circle Segment
or	
Menu Item:	Draw Ellipse Segment

After selecting one of these functions, draw the circle or ellipse in the same way as for the complete figure. Then move the cursor to the beginning of the required segment (the first point in a clockwise direction) and click once with the left mouse button.

If the left mouse button is now pressed and held down, a radius will stick to the cursor and can be drawn clockwise around the circle or ellipse. On the bottom line the angle drawn is shown.

When the segment has the required angle, release the left mouse button and click once. This completes the operation.

Number of Vectors for a Circle

Before a circle (ellipse or arc) is drawn, the following dialog can be used:

Menu: Preset
Menu Item: Corners for Circle

You may select from 3 to 180 corners per circle. In GFA DRAFT *PLUS*, a circle is made out of many vectors. The default is 36 lines per circle, but you may increase that to 180 if a smoother circle is required.

If the number of vectors is smaller, you may be able to see the individual lines. This can be used to draw a multi-sided shape with equal sides.

The same is true for ellipses, except the sides will not be of equal length.

Arc Through Three Points

An uncomplicated way to draw arcs is also provided:

Menu: Special
Menu Item: Arc 3 points

Three points are defined and then the computer calculates the arc which runs through these points. After the function has been selected, simply click three points on the screen with the left mouse button and an arc appears which runs through these points.

Note: This function also allows you to draw smooth curves through several points. Take three points on the line for the first part of the curve. The last point of the first curve becomes the first point of the next part, etc. If the circle going through the three points is so large that it will no longer fit on the drawing, the message Object Off Drawing Area *will appear and the circle will not be drawn.*

Rounding Corners

It can be very difficult in some graphics programs to round off the corner formed by two lines meeting at a point. GFA DRAFT *PLUS* has a very simple but elegant solution to this problem. You simply define two lines and specify the radius for the rounding, and the program does the rest!

Menu: Special
Menu Item: Round Corners

A dialog field appears in which the radius for the rounding (between 1 and 99 mm) must be entered. After clicking the OK box, click with the left mouse button the two lines that form the corner to be rounded. The lines disappear and reappear with a rounded corner.

The lines do not have to exactly meet to be rounded. If necessary, they will be lengthened to allow for a smaller rounding radius.

If you have rounded a corner but the radius was not correct, you can cut it out by choosing the *Cut* function in the *PRESET* menu. Pull a window over the corner and delete the contents of the window. Then repeat the rounding with a new radius.

Creating a Perpendicular

Sometimes a line is required which is exactly perpendicular to an existing line. If the existing line is not horizontal or vertical this must be judged with the eye. A special function is available to do this:

Menu: Special
Menu Item: Perpendicular

After selecting this function, specify the line from which a perpendicular is required by clicking on it with the left mouse button. If the left mouse button is held down the mouse can be used to "pull" a perpendicular on either side of the line. It can also be moved along the line or even further along the projection of the line. When the perpendicular is in the desired position and has the correct length, release the mouse button and click once again to fix the new line.

Angle to a Line

The function *Angle to a Line* works in the same way as drawing perpendiculars, except instead of 90 degrees the angle can be specified at which the new line will meet an existing line.

The angle is entered in a dialogue field as the deviation from the perpendicular and can be between -90 and +90 degrees. Positive angles are counter-clockwise from the perpendicular and negative angles are clockwise from the perpendicular.

Menu: Special
Menu Item: Angle to a Line

Parallel to a Line

This selection allows you to duplicate a line with the same angle and length. This line is drawn parallel to an existing line.

Menu: Lines
Menu Item: Parallel

Move the cursor to a line and click with the left mouse button. The line will now appear as a dotted line. Holding down the left mouse button will create an exact copy of that line. You can move this line to any position on the screen and anchor it by clicking the mouse button.

This process may be repeated as many times as desired. To deactivate this function click the right mouse button.

> *Note: This parallel line can be moved in any direction. If you wish to draw a line that is vertical or horizontal, you must press the* ALTERNATE/INSERT *key and then use the cursors to move the line.*

Tangent to a Circle

This selection allows you to draw a tangent parallel to a circle:

Menu: Lines
Menu Item: Tangent

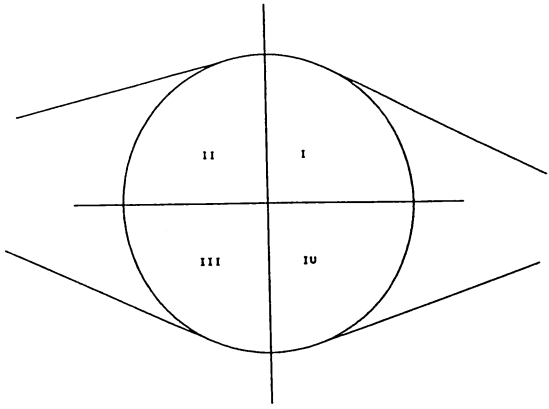
Move the cursor to the circle and click the left mouse button. Now hold down the left mouse button and draw the tangent. GFA DRAFT *PLUS* will compute the point at which it touches the circle. You can also move the cursor around the circle and draw the tangent in any position or length. To anchor the tangent just click the left mouse button.

This allows you to draw as many tangents as desired. To stop the process, just click the right mouse button.

> *Note: The tangent ends at the point where it touches the circle. If you wish to extend this line, you must terminate the* Tangent *function and select the* Lengthen *function from the* LINE *menu. The tangent can now be extended beyond the point where it touches the circle.*

Since the tangent ends when it touches the circle, there are two possible directions in which it can extend from the circle. The direction depends on where you click the circle. The following picture shows the four different quadrants of a circle.

Fig. 10: Directions of a Tangent



The Hatching Function

The *Hatching* function will be frequently required to highlight something in a drawing or to make an object look more solid.

Two conditions must be met if an area is to be hatched:

a) **The lines need to meet at a point.** You can be sure of this if the *Locking* function was used or the figure was drawn with one of the *Rectangle/Circle/Ellipse* functions.

b) The lines need to form an enclosed polygon. That means that if you follow the line around from a particular point it eventually returns to the same point.

If one of these conditions is not met, you will get the error message Polygon Formation Not Possible.

> *Note: Lines no longer need to actually meet to be hatched in GFA DRAFT PLUS if you use the* LINES Select *function instead of the* PRESET Cross Hatch *function.*

The hatching is done in the line type that has been set in the *LINES* menu.

With **GFA DRAFT *PLUS***, you can overlay two kinds of hatching. The parameters for each hatching can be specified individually:

> **Slope of hatching: +/- 90 degrees**
> **Separation of lines: 0.2 to 5 mm**

Interesting effects can be created by hatching with two different slopes and separations.

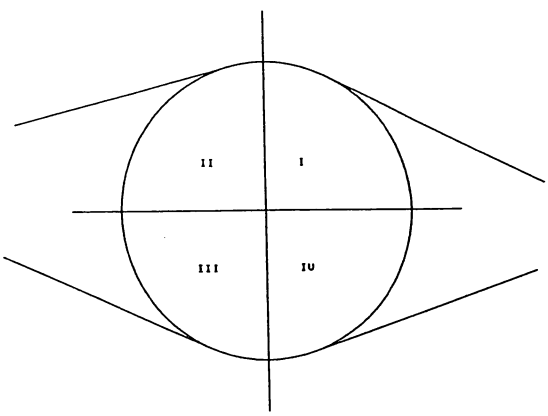
Preset Hatching

Before you can use the *Hatching* function, it must be turned on by selecting the following menu item:

> **Menu:** Preset
> **Menu Item:** Cross Hatch

Fig. 11

Fig. 10: Directions of a Tangent



The Hatching Function

The *Hatching* function will be frequently required to highlight something in a drawing or to make an object look more solid.

Two conditions must be met if an area is to be hatched:

a) **The lines need to meet at a point.** You can be sure of this if the *Locking* function was used or the figure was drawn with one of the *Rectangle/Circle/Ellipse* functions.

To start the function the following is selected:

Menu: Special
Menu Item: Hatching

Click a line on the polygon to be hatched. If the program can form a polygon including this line it will show it in dotted lines. You are then asked if the computer should continue to search since a line can be a part of many polygons (for example, a line can simultaneously form part of a smaller and larger rectangle).

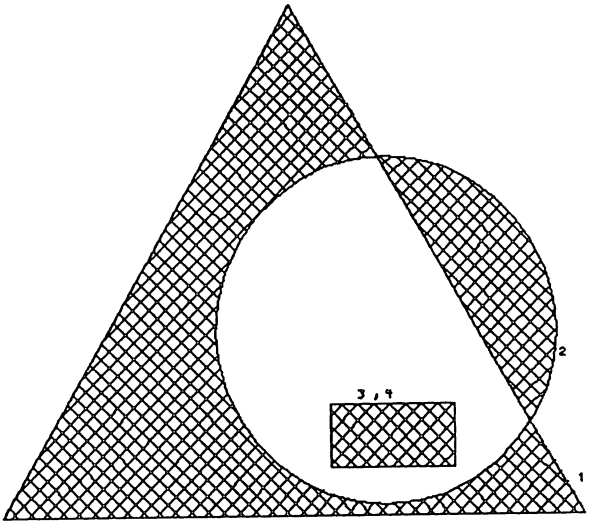
If you want to hatch the dotted polygon, click the OK button. To select another polygon click the MORE box. If you do not want to look for any more polygons, click the second OK box. If the computer cannot find any more, it prints the message Polygon Formation Not Possible and the effect is like you never clicked this line.

You are free to select further polygons. If the polygons chosen are inside each other, the contents of the first polygon will be hatched, the second left clear, the third hatched, etc. Clicking the same polygon again will start the hatching process.

If several separate objects have been chosen, they will all be hatched.

The following picture shows an example of hatching. The numbers indicate the order in which the lines were drawn.

Fig. 12



Cancel this function by clicking the right mouse button.

If the message Polygon Formation Not Possible appears, try clicking another line on the polygon.

A tip: If the hatching was not satisfactory it can be deleted, vector by vector, with the BACKSPACE key. Be careful that you do not delete anything outside the polygon. The mode should not be in *Hatching* when doing this.

Hatching with Line Selection

The *Select* function, discussed in Chapter 3, can be used to fill the area between lines without the area being enclosed in a polygon.

Menu: Lines
Menu Item: Select

Click the lines between which hatching is to be performed. These lines will appear dotted. To end this process, click the last line twice.

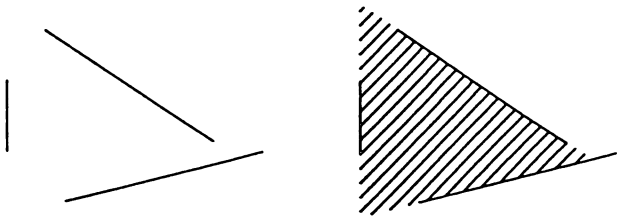
Menu: Special
Menu Item: Hatching

Selecting the above item will perform the hatching.

If two lines were selected, the area between the two lines will be filled with the hatching pattern. If more then two lines are selected, the computer will calculate the points of intersections. Should those points not fall on the drawing area, the message Object Off Drawing Area will be displayed on the screen and the hatching process will not be performed.

Fig. 13: Hatching by Selecting Two Lines

With Many Lines, the Intersection will be Calculated



Construction Lines

If the measurements of a line are to be shown, it is usual to have short lines projecting out from the object onto which small arrows point. This work is made easier by a special GFA DRAFT *PLUS* function.

Menu: **Special**
Menu Item: **Construction Lines**

After selecting this item, go to the line that is to have dimensions. Press the left mouse button and hold it down. As you move the cursor away from the line, the construction line is formed. When the construction line is the correct length, release the left mouse button and click once.

If you want to draw another construction line to the same height elsewhere on the line, click once at this point on the line and a line will be drawn with the same height as the first.

- The length of the construction line will always be rounded to a multiple of 5mm (it must be at least 5 mm). This rounding makes it easier to make all construction lines the same length. The length will be rounded to the next highest number (11 mm will be 15 mm).

- The construction lines lock automatically onto the nearest end point of the chosen line.

- The construction lines are drawn in the style defined in the *PRESET Lines* menu.

A tip: If you want to put dimensions on a line which has rounded corners, you probably do not want the construction lines to be at the point where the rounding begins. If you want them at the outside edge:

Place a construction line at the end of the line. Move the cursor to the end of the rounding and click once with the left mouse button. The construction line moves to where the end of the line would be if it was not rounded. When you have drawn all the construction lines, the first line can be deleted.

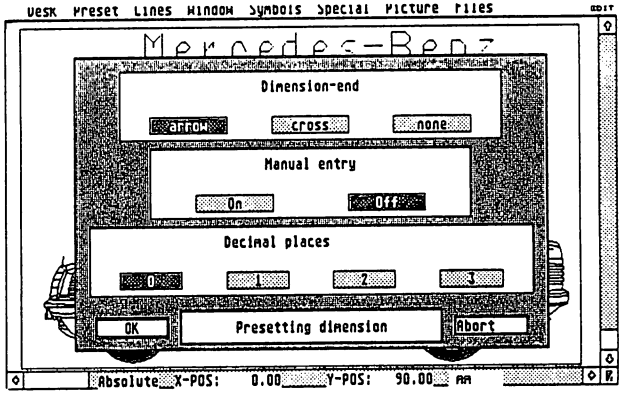
Construction lines for dimensioning circles and ellipses should be created with the normal line drawing functions.

Dimensions

As with hatching, the kind of dimensions can also be set with a dialog box.

Menu: Preset
Menu Item: Dimensions

Fig. 14



In the dialog field **Dimension Line Delimiter**, you select what will appear at the ends of the dimension line. You can choose between *Arrow*, *Line*, or *Nothing*.

If you wish to enter the dimensions manually, you must click the OFF option in the *Input Manual* dialog box. In this case only the dimension line but not the dimension is drawn.

In the next dialogue field you can choose the number of decimal places (0-3) for the measurement.

The actual dimensions are put onto the drawing with another function.

Menu: Special
Menu Item: Dimensions

After starting this function, go to the first construction line and click with the left mouse button. Repeat this for the second construction line and a line (the dimension line) appears between the two points.

Now go to the place on this line where the dimension should be and click again with the left mouse button. The number is written horizontally and begins at the vertical cursor crosswire.

If the chosen construction lines are not parallel, a dimension arc is produced instead of a line. The dimension then represents the angle between the two lines.

The dimension does not have to be placed between two construction lines. For example, the two opposite sides of a rectangle can be chosen. The dimension line will then appear inside the rectangle.

- The dimension lines are drawn in the style defined in the *LINES* menu.

- The dimension itself is written in the style defined in the *PRESET Marker Pointer Set* dialog box. The point at which the dimension line and the construction line meet depends on where the first construction line was clicked.

The dimension line will always be 2 mm before the next 5 mm step, but will be at least 8 mm long.

The Construction Line	The Dimension Line
1 to 10 mm	8 mm(10-2 mm)
11 to 15 mm	13 mm(15-2 mm)
16 to 20 mm	18 mm etc..

Entry

This function was included to simplify the process of putting text in the drawing. The text is entered once and can then be put in the drawing by clicking the mouse button. The number contained within the text can also be incremented. This function is started as follows:

Menu: Special
Menu Item: Entries

This dialog box contains two lines of 16 characters. The text entered here will be copied to your drawing by a click of the mouse button. The second line will be shown right below the first line.

Just below these two lines, an *Increment* and a *Constant* box are shown that allow you to determine the way the text will be entered into the picture:

Increment: The number contained in the first string is incremented by 1 whenever the mouse button is pressed while using the *Entry* function. This could be used in an electrical drawing as follows:

Using the following text:

R10
50k

the following results when using *Increment*:

R10	Next click	R11	R12, etc.
50k		50k	50k

If no starting value is given in the text, the number will start with a value of 0.

Constant: The text is placed in the drawing as it actually appears.

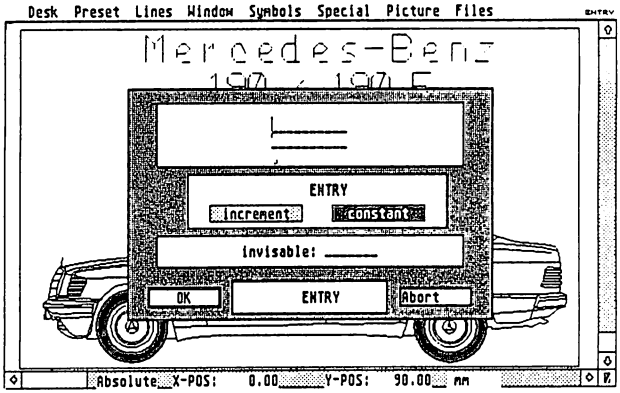
The Invisible Text Dialog Box:

This allows you to enter up to seven characters that will not be shown on the drawing.

This mode is started by clicking the OK box. Pressing and holding down the left mouse button will cause the text to follow the cursor. Once the desired position is found, the text is anchored by clicking the button. The size and rotation of the characters are selected under *PRESET Marker Pointer Set.*

Terminate this function by pressing the right mouse button.

Fig. 15



Chapter 5:

Working With Symbols

Working With Symbols

What are Symbols?

Symbols are any combination of lines and text characters that have been defined as a logical unit. Every symbol is stored as a file on a diskette and can be used as often as required.

Why Use Symbols?

In most fields certain objects appear frequently in drawings. For instance, resistors, transistors and IC's are commonly used in electronics, and chairs and windows in architecture. By using symbols you can define these objects once and then use them many times, even in different drawings.

Creating a Symbol

After you have drawn the object that you wish to define as a symbol, frame it in a window as described earlier. Then select the following:

Menu: **Symbols**
Menu Item: **Store Symbol**

An option box appears (similar to the *Read Image* function). In the directory line the following appears: A:*.SYM.

This appears because the file name of a symbol file consists of a maximum of eight alphanumeric characters and the extension .SYM. The extension denotes the type of file, in this case, a symbol file.

There are now two possibilities:

a) **Replace an Existing Symbol:** Click the name in the directory window.

b) **Create a New Symbol:** Delete the entry line if it contains a name and enter the new name with the keyboard.

IMPORTANT: Don't forget the .SYM extension! After clicking the OK box the symbol is saved.

A tip: If you intend to use the symbol in different sizes, store it in its largest form to avoid rounding errors when reducing it later.

Loading a Symbol

This function loads a previously stored symbol so it can be included in the current picture.

Menu:	Symbols
Menu Item:	Load Symbol

The option box in which all of the symbols present on the diskette are listed appears. If they do not all fit in the directory window you can scroll with the scroll bars (as described in *Read Image*).

Click the required symbol in the directory window and then click the OK box. After a short time, the symbol will appear.

Press the left mouse button and hold it down. The symbol now sticks to the cursor and can be moved into its correct position.

Clicking the left mouse button fixes the symbol into place. If the right mouse button is clicked before the symbol is fixed, it will be deleted.

Deleting a Symbol

If a symbol is no longer required on the diskette it can be deleted.

Menu: **Symbols**
Menu Item: **Delete Symbol**

The option box appears once again and the symbol to be deleted must be clicked. After the OK box has been clicked the symbol file is deleted. If you have changed your mind click the ABORT box instead.

Renaming a Symbol

This function allows you to change the name of a symbol already stored on diskette.

Menu: **Symbols**
Menu Item: **Rename Symbol**

The symbol to be renamed is clicked in the directory window and, after clicking the OK box, the new name can be entered.

Loading the Function Keys with Symbols

If a symbol is required often, you can save time by assigning it to a function key. Each time this function key is pressed the symbol is instantly available. The symbol must already be on diskette before it can be used in this manner.

Loading a Function Key:

Press one of the function keys. In the option box click the symbol to be loaded.

Now every time the function key is pressed this symbol will be loaded. Positioning and fixing is the same as for normal loading.

Reloading a Function Key:

If you want to change the symbol assigned to a function key press SHIFT/Function key. The rest is the same as for loading a function key.

Displaying the Function Keys:

As all ten function keys can be assigned a different symbol it is possible to forget which symbol belongs to which key.

Menu:	Special
Menu Item:	Status: Function Keys

This function shows a picture of all of the function keys and the symbols assigned to them.

Moving the Symbol

After the loading the symbol, it is usually moved to the desired position on the drawing (for example, a Resistance symbol at the end of a line).

To simplify the process of moving the symbol, a function was added that allows you to select a point within the symbol. The symbol is moved with the cursor at that point and can be moved to the end of a line.

Menu: Preset
Menu Item: Locking

After loading the symbol, you must select the desired point by moving the cursor to the desired position within the symbol. You must then press and hold the left mouse button. The symbol can now be moved to the desired position with the mouse. The symbol is positioned by clicking the left mouse button.

Modifying Symbols

It is possible to change existing symbols. After a symbol has been loaded and secured, it can be modified.

> WARNING: ***If you wish to delete single vectors from the symbol with the*** DELETE ***key, you must make sure that the menu item*** Erase Object ***in the*** WINDOW ***menu is deactivated (not check marked), or the whole symbol will be deleted.***

After changing the symbol, it can be saved in the usual fashion.

Chapter 6:

Delete Functions

Delete Functions

There are three possible ways of deleting vectors, text characters, or symbols in the work window:

Deleting with a Window

This function has already been described under window functions. Note that the setting extract deletes only those vectors completely in the window. The cut setting deletes everything in the window and cuts off vectors where they enter the window.

The applicability of window functions, either text, lines, or both, determines what is deleted in the window.

This function allows you to delete individual vectors contained within circles, ellipses, hatchings and symbols.

Deleting with the BACKSPACE Key

With this key the vectors, characters, or symbols are deleted one at a time in reverse order (i.e.the last drawn is deleted first).

Circles, ellipses, hatchings and symbols are completely deleted with the BACKSPACE key.

Note: Use caution when deleting with the BACKSPACE *key, since after several objects are deleted it becomes hard to determine which is next.*

Deleting with the DELETE Key

This key deletes the vector, character, or symbol that is nearest to the current cursor position.

Whether a symbol, hatching, a circle or an ellipse is completely deleted or deleted vector by vector depends on the setting of the following item:

Menu: Window
Menu Item: Object Delete

Object Delete OFF: Only individual vectors or characters are deleted from the given object. This process should be used when modifying a symbol.

Object Delete ON: The object is completely deleted whenever the DELETE key is pressed.

Undoing a Deletion

If you have deleted an object accidentally with the window, the BACKSPACE key, or the DELETE key and want it back, you can press the UNDO key. This undoes the last deletion.

Deleting the Whole Picture

Menu: **Picture**
Menu Item: **Delete Picture**

With this function the whole picture can be deleted. After choosing this function, a dialogue field asks if you are sure you want to do this. If the OK box is clicked the picture is deleted.

> *Note: This function does not effect picture files on diskette. Therefore, if the picture has already been stored on diskette it can be read in again.*

Chapter 7:

Functions for the Whole Program

Functions for the Whole Picture

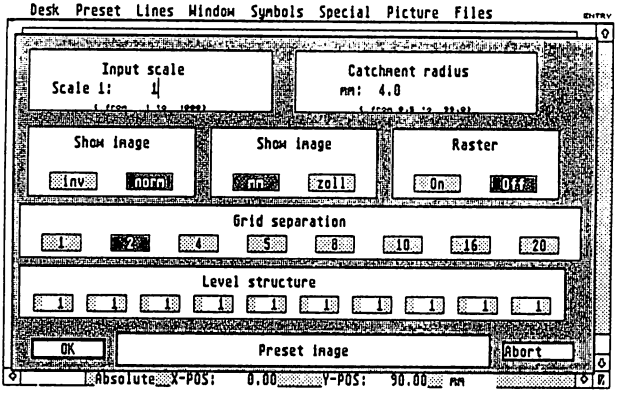
Preset Image

A dialog box appears after the following function is selected:

Menu: Preset
Menu Item: Image

This allows you to set the scale, determine whether the picture will be shown in the normal or inverse shade, in inches or millimeters, and the spacing of the optional grid.

Fig. 16



Setting A Scale:

In normal drawing to scale, all measurements have to be transformed to the scale being used. GFA DRAFT *PLUS* spares the user from this time consuming calculation. The program is told the scale and the coordinates are shown as they would be in reality.

If, for example, the area of a room is 5.30m x 4.27m, then these distances can be read in the drawing from the coordinates.

The scale can be from 1:1 to 1:1000. For scales up to 1:10 the coordinates are shown in meters, for 1:1 to 1:9 in millimeters.

Think carefully beforehand about the choice of a scale so that there are no unpleasant surprises later when objects do not fit into the picture because they are too large or too small. Let's go through an example of choosing a scale:

You want to draw a room that is 5.30m x 6.10m. The drawing should fit in an area of 200 x 300 mm.

The maximum width of 6.10 m should fit within 300 mm.

The maximum height of 5.30 m should fit within 200 mm.

Scale (X direction) = 6100 mm/300 mm = 20.33
Scale (Y direction) = 5300 mm/200 mm = 26.50

Since the drawing must fit in either direction, the larger of the two values (26.5) must be used.

Therefore, in order to keep a reserve, we therefore choose a scale of 1:30.

> *Note: The indicator of the coordinates will now show meters.*

It is possible to choose any scale desired when using GFA DRAFT *PLUS*, but architects usually work with a scale of 1:50 or 1:100.

Showing the Image:

Inverse Image: Depending on the kind of monitor being used and personal taste, an inverse image is sometimes preferred. In the *Inverse* mode the light areas of the screen become dark and the light areas become dark. This is selected in the *Show Image* dialog box under *PRESET/Image*. The inverse representation remains intact even after GFA DRAFT PLUS is ended. If this is not desired, you must change this setting to normal before ending the program.

Inches or Millimeters: Normally, the coordinates are shown in millimeters or meters. This menu item switches the display to tenths of an inch or inches. This setting should be adjusted before you start the drawing or some objects may contain values that are not possible to use.

Laying a Grid:

A grid can be laid over the picture in order to help with placing objects correctly in the picture.

In the dialogue box you can choose a grid spacing of 1, 2, 4, 5, 8, 10, 16 or 20. The *Raster* field switches the grid on and off. The grid will not be printed or plotted.

Locking

This function allows you to select a radius to which the end points can be locked:

Menu: Preset
Menu Item: Locking

The locking of lines, arcs through three points, and destination points of symbols are made possible with this function.

Moving the Whole Picture

Despite good planning you will sometimes find that you do not have enough room on one side of the picture for the object you wish to draw.

Menu: Picture
Menu Item: Move Picture

The picture can be moved by a positive or negative amount in the X and Y directions. A positive amount is to the right (X) and up (Y).

If the drawing would exceed the picture because of this movement, a warning is given and the movement does not take place.

Zooming the Whole Picture

Menu: Picture
Menu Item: Zoom Picture

This function is selected if the contents of the entire picture are to be enlarged or reduced. The zoom factor can be between 0.01 and 10.

> *Note: This function alters the size of the objects by the zooming factor.*

If the drawing is already so large that after zooming with the given factor it would no longer fit, a warning is given and the zooming is not carried out.

The reference point for zooming is found on the bottom left of the picture. If the picture is reduced it shrinks into the bottom left of the picture.

> *Note: Reducing and subsequent enlarging can cause inexactness in the objects.*

Rotating the Whole Picture by 90 Degrees

Menu: Picture
Menu Item: Rotate 90 Degrees

This function rotates the entire picture 90 degrees counter-clockwise. Objects that were in the bottom left corner of the picture are now in the bottom right corner.

Help Lines in X and Y Direction

These serve the same purpose as a grid but here the number and the position of the lines can be determined by the user.

Menu: Lines
Menu Item: Help Lines X
or
Menu Item: Help Lines Y

If one of these functions is selected, every time a point in the work window is clicked a help line in the X or Y direction is drawn. The function is ended by clicking the right mouse button. Whether or not the help lines are shown depends on the setting of the following items:

Menu: Preset
Menu Item: Lines

This function allows you to turn the help lines on or off. The help lines are not erased when they are turned off.

Help lines may be deleted by using the DELETE or BACKSPACE keys. This is also true if the help lines are turned off. After the help lines have been turned on again some may be missing.

Free Memory

Menu: Picture
Menu Item: Free Picture Memory

This shows the percentage of memory still available for the drawing.

Status

This function allows you to get more information about an object on the screen.

Menu:	**Special**
Menu Item:	**Status**

After selecting this function, you can click lines, data, symbols, etc. and a dialog box will show the information on the selected object. This function is terminated by clicking the right mouse button.

Working on Several Levels

The picture is drawn at the work level. Up to 9 other pictures can be superimposed onto it.

This offers many possibilities. For example, you can draw the components of a circuit board and store it on the second level. On the work level, you can draw the printed circuit itself and superimpose the components onto this. The pictures can be printed or plotted individually or overlaid. Each level can be plotted in a different color.

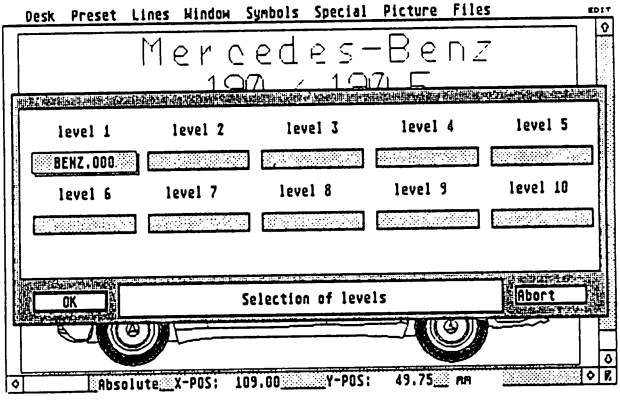
> *Note: To keep some kind of order, you should have a system of naming files. For instance, the extension of the basic drawing could be .000 and the overlays that belong to the picture could have the same name but extensions .001, .002, etc. This is only a suggestion. The program allows you to name the files as you wish.*

Selecting Level

The main work level is Level 1. If you want to define other levels for layering objects, choose the following item:

Menu: **Picture**
Menu Item: **Select Level**

Fig. 17



In the dialogue field that now appears, there is a field for each level. Click the level from 1 to 10 that you wish to define. A list of files appears and the file that is to be associated with this level must be clicked. To select a new file just enter a name that does not yet exist.

Note: One of the dialog fields has a shadow attached to it. This is the work level. The data of this level is the one that is used when working with the FILES *menu (like* Read Image, Save Image, *etc.).*

The pictures that form the sub-levels (2 to 10) are put onto the screen directly from disk. When using a RAM or hard disk this happens very quickly. From floppy disk, it takes a little longer.

Note: Drawing can only take place in the work level. This work level is loaded and stored with the functions in the FILES *menu as described previously. If you want to work on a picture that has already been assigned a level, it can be read in as usual. You will be asked if the current picture is to be stored. Click the* OK *box.*

Show Levels

The display of levels 2 to 10 can be switched off.

Menu: **Picture**
Menu Item: **Show Levels**

If this item is active (marked with a check), the levels 2 to 10 are shown. If it is off, the levels are not shown on the screen but the level associations remain intact.

Changing the Work Level

To change the work level, just press the ALTERNATE/CONTROL keys together with one of the function keys (F1 to F10). The number of the function key corresponds to the number of the desired level. When changing the work level, the current level is saved with the same name as the one that it was loaded with.

If the work level does not have a file name, the file dialog box will appear.

Level Colors

If you have a color monitor, each level can be shown on the screen in a different color. With a monochrome monitor the colors are shown as different shades of grey. In this case, you should determine if the color selected makes any sense.

The color for the level may be selected with the following function:

Menu: Preset
Menu Item: Image

A dialogue field is shown with a field for each of the ten levels. Each field contains a number between 0 and 9 representing the color associated with each level. Clicking one of these fields increases the number by one. In this fashion, the color level for each field can be selected.

Chapter 8:

Commands

Commands

With **GFA DRAFT** ***PLUS***, one can input the vectors by using commands. This greatly simplifies the drawing process in some cases since the position and angle can be measured with a command rather than by using the mouse.

These commands can also be read from a data file. In order to use this function a means was added to **GFA DRAFT** ***PLUS*** that enables the communication with other programs. For example, you can compute the vectors using **GFA BASIC**, translate them into commands and then draw them with **GFA DRAFT** ***PLUS***.

It is possible to take statistical values that are computed by **GFA BASIC**, translate them to commands and use those commands to draw a bar graph. Mathematical functions can also be represented by a graphic picture. The possibilities are endless!

Selecting the Command Mode

This can be selected by clicking with the mouse:

Menu: **Special**
Menu Item: **Commands**

This mode is terminated by pressing the right mouse button. These commands are divided into two groups since their structure is different. However, they can also be combined.

Commands I

MA x,y	(Move Absolute)
MR x,y	(Move Relative)
MP angle,length	(Move Distance)
DA x,y	(Draw Absolute)
DR x,y	(Draw Relative)
DP angle,length	(Draw Distance)

Move: A starting point is selected that will be used for drawing the vector or for future MR or MP commands.

Draw: A line, whose start depends on the *Move* command or the last vector position, is drawn. The second point of the line is set with the parameters.

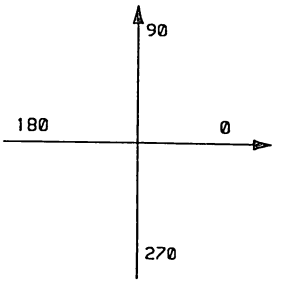
Absolute: The values show the coordinates within the picture. The X and Y coordinates may be a value between 0 and 1300 mm.

Relative: The values show the distance from the last point that was drawn or moved. The X and Y coordinates may be a value from approximately 1300 to 1300 mm.

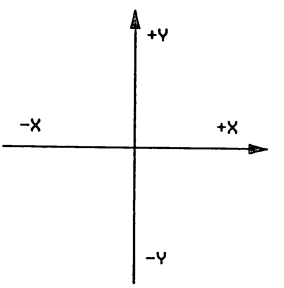
Distance: Similar to *Relative*, except the distance from the last point is given as an angle and a length. The angle must be a value between 0 and 360 degrees and the length must be between 0 and approximately 1700 mm. The following pictures show the direction of the angle used by commands with Distance position values.

Fig. 18:

Example of Commands Using Polar Coordinates



Example of Commands Using Relative Coordinates



Angles for Commands

Direction for commands with *Distance* or *Relative* coordinates.

While using commands with *Relative* or *Distance* position values, it is possible that the selected point is not contained within the picture. In this case, the

message Object Not Within Drawing Area is displayed and the command is ignored.

Input of Commands

The *Command* mode must be selected.

If you press the first letter of the command, the command line will appear. You can now enter the rest of the command. There must be a blank between the command and the coordinates. End input with the RETURN key, and the command will be executed. The *Command* mode is terminated by pressing the right mouse button.

The selected scale makes no difference. The type and width of the line depends on the current setting that was selected by using the *PRESET Lines* function. This dialog field can be changed while in *Command* mode.

If a command causes you to leave the current working window, that window will move itself to the actual position. The command MA 600,600 will cause the working window to move to that position. The following examples all draw a rectangle of size 10 x 20 mm in the lower left corner at position 20,20 (x,y).

1.	2.	3.
MA 20,20	MA 20,20	MA 0,0
DA 20,30	DR 0,10	MR 20,20
DA 40,30	DR 20,0	DP 90,10
DA 40,20	DR 0,-10	DP 0,20
DA 20,20	DR -20,0	DP 270,10
		DP 180,20

Remarks for Three Command Sequences:

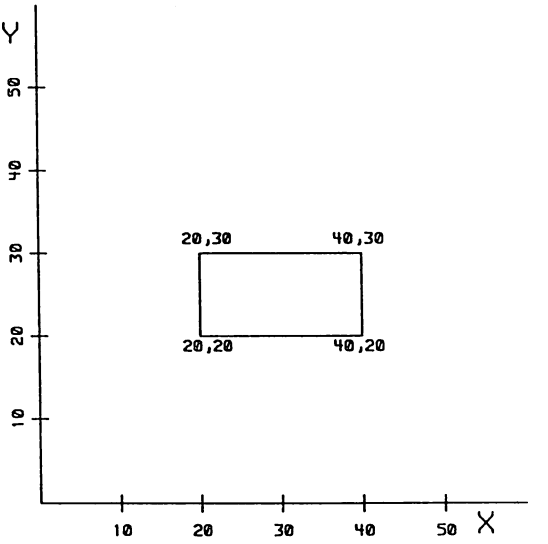
1. The lines are always drawn from the last position to the absolute coordinates.

2. The destination of the lines is always given in coordinates relative to the last position.

3. The lines are always given with angle and length and start from the latest position.

The following picture shows the rectangle for the previous commands.

Fig. 19: A Square with the Coordinates of the Corner Points



Altering the Commands Line

The UNDO key allows you to retrieve the last command line. This line can then be modified. The vertical bar that shows the current position can be moved to the left and to the right by using the cursor keys. The BACKSPACE key erases the character just left of the vertical bar.

Chaining Commands

One can add as many commands in the input line as will fit. The commands must be separated by using a semi-colon (;). For example:

MA 20,20; DR 0,10; DR 20,0; DR 0,-10; DR -20,0

Duplicating Commands

A command sequence may be put within parenthesis; in this case, the number in front of the parenthesis dictates how many times the command will be performed.

nnn(commands)
The number must be a value between 1 and 9999.

It is possible to use more than one parenthesis, but remember that all parenthesis that are opened must also be closed, for example: MA 10,10; 5 (DP 90,5; 3(DR 5,5)). The MA command is only performed once and the commands in the outer parenthesis are performed five times. The commands in the inner parenthesis are performed 3 times for every command in the outer parenthesis (15 times).

Runtime Variables for Commands

It is possible to use up to ten variables. These variables are from ?0 to ?9 and are assigned by using the equal (=) sign. For example: ?0=5;?1=6;MA ?0,?1, which is the same as MA 5,6.

It is also possible to perform arithmetic with these variables. All computations are performed from left to right (2+3*4 =20).

Legal computation characters are: + - / *

Example: ?0=?0*2+1.
The variable ?0 is doubled and then incremented by 1.

Commands II

The following commands are usually used for plotters:

PU:Pen up;: The FD and BK commands will only change the position (the pen travels across the drawing without actually touching it).

PD:Pen down;: The FD and BK commands will draw a line (the pen is touching the drawing).

TT Grad: This sets the direction in which all future commands will travel. The grad must be a value between 0 and 360 degrees. The direction of the angles are as described in an earlier picture.

RT Grad: The direction will change the number of degrees to the right.

LT Grad: The direction is changed to the left.

FD x: (Forward): Move forward by x mm using the current direction. If the pen is up then only a new starting point is set. If the pen is down the actual line will be drawn.

BK x: (Backward): Move backwards by a value of x . If the actual angle is 0 degrees, the pen will move 180 degrees.

The effect of this command can best be demonstrated with an example. The following commands could have been added on one line by using the ; separator.

```
MA 20,30
```

The starting point is set to position X=20, Y=30.

```
TT 90
```

The direction is set to 90 degrees.

```
PD
```

The pen is set in the down position.

```
RT 10
```

The actual angle is set 10 degrees to the right. The new direction is 80 degrees,

```
LT 30
```

The actual angle is set 30 degrees to the left. The new direction is 110 degrees.

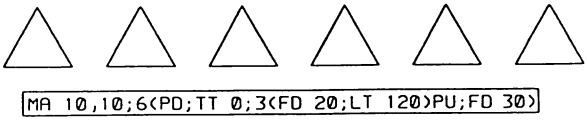
```
FD 50
```

A line 50 mm in size in drawn at an angle of 110 degrees. The starting position is 20,30.

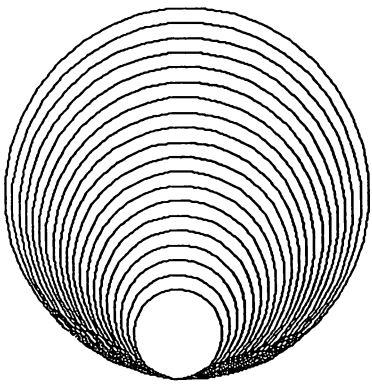
All future FD and BK commands will use the position of the end point of that line as their new starting point.

If you want to execute the following circle example, make sure to first use the command MA 600,10; otherwise, the object will be off the drawing area.

Fig. 20



```
MA 10,10;6(PD;TT 0;3(FD 20;LT 120)PU;FD 30)
```



```
?0=5;TT 0;PD;20(?0=?0+1;(36(FD ?0;LT 10)));PU
```

Saving Commands

The command line can be saved to a file. Press CONTROL-S after the command has been entered and a dialog box will appear. You can now enter a file name (with the extension .MAC). Just click the OK box and the command line will be saved to the diskette. You can load the command line by pressing CONTROL-L.

Using Commands from the Diskette

If you press CONTROL-L while in the *Command* mode, the dialog box will appear. You can then select a file that contains a command that was saved as mentioned above. The command file has the extension .MAC.

These files could also be created with any text editor, such as 1st Word™, or you can use the editor in GFA BASIC. Your GFA DRAFT *PLUS* diskette contains an example of command data.

It is also possible to use models created with GFA OBJECT. There is a command in the GFA OBJECT *OPTION* menu for saving pictures in GFA DRAFT *PLUS* .MAC format. These will be saved as two-dimensional diagrams.

Chapter 9:

Printing and Plotting

Printing and Plotting

Printer/Plotter Installation

On your **GFA DRAFT *PLUS*** diskette you will find a separate program called CONFIG. This is to supply **GFA DRAFT *PLUS*** with the parameters of your printer or plotter. This program is only required if you have a non-standard printer or plotter. The standard settings are:

Printer: EPSON
Plotter: HP7475

The printer and plotter parameters are stored in the file GFADRAFT.INS. **GFA DRAFT *PLUS*** will recall these parameters the next time the program is loaded.

A description of the contents of this parameter file is given in **Appendix B** so that it may be modified for other printers.

Printer and Plotter Menu

The scale on paper matches the scale of the picture as long as the zoom factor in the following dialog box is set at 1. The setting of the zoom factor of the picture does not make any difference.

GFA DRAFT *PLUS* determines if the drawing will fit on the paper. If it does not fit, the computer will split the drawing into smaller sections.

The drawings will usually be printed sideways. The height of the picture (Y direction) corresponds to the width of the paper.

The following two dialog boxes allow you to select the printer and plotter options:

Menu: Preset
Menu Item: Printer
or
Menu Item: Plotter

Fig. 21

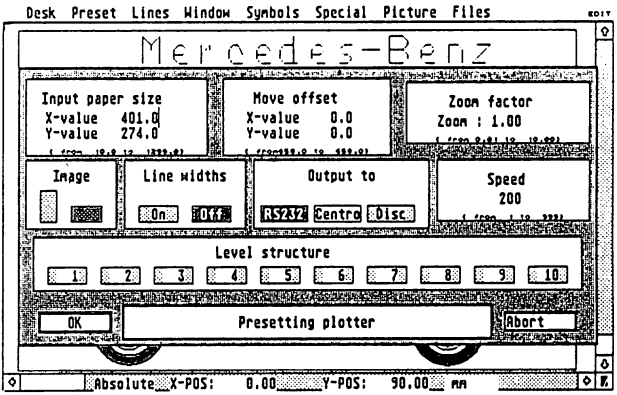
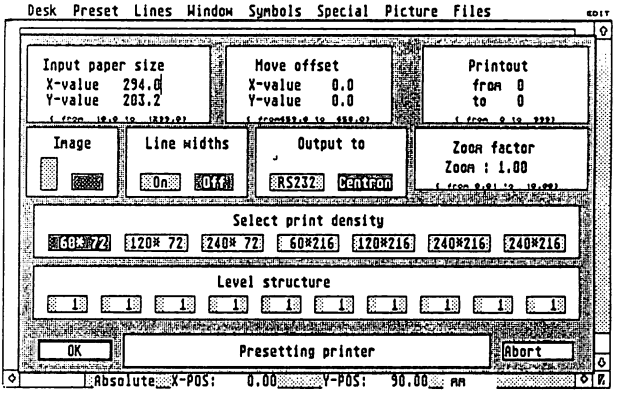


Figure 22



Paper Size:

This allows you to set the actual size of the paper. The X and Y values must be between 10 and 1299 mm. When using a printer with continuous paper, the X value corresponds to the usable width and the Y value corresponds to the length of a single sheet. The X and Y offset values can be changed to leave a margin to align the object so that the drawing fits nicely on the paper when printing or plotting. The picture can be moved in both directions by 0 to 199 mm.

Moving the picture reduces the effective size of the paper.

Printout From/To:

If the picture cannot fit onto one page, it will be printed on multiple pages.

This field allows you to select the page range of the picture to be printed.

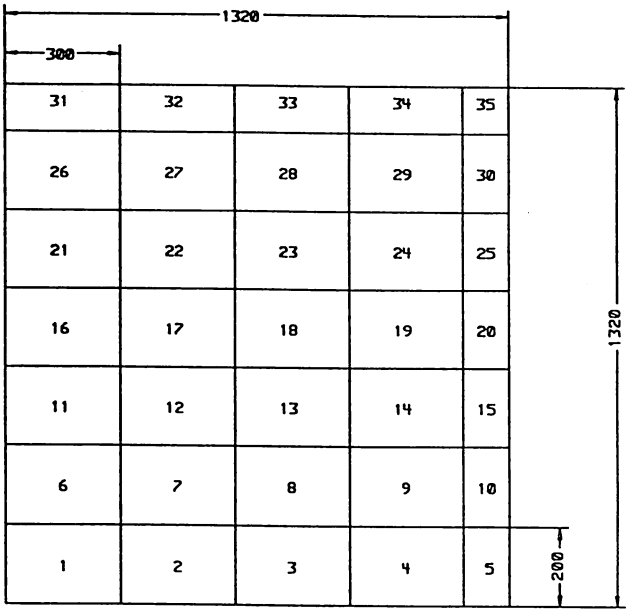
This field appears only in the *PRINTER* menu, since a printer with continuous paper can automatically select the next paper. This setting could not work with a plotter since the paper must be changed by hand.

The following picture will show you the order by which the individual pages are printed:

Paper size: X value: 300
Y value: 200

Zoom Factor for Output: 1

Fig. 23: Printing Order for Larger Pictures



Plotting Speed:

This field appears only in the plotter dialog box, It allows you to set the speed at which the plotter should operate. This speed must be a value between 1 and 999 mm/sec. The maximum speed allowable will depend on your plotter. Using a slower speed could however improve the quality of the drawing.

Rotating the Picture 90 Degrees:

Clicking the *Image* symbol of the far left side of the box will print or plot the picture at a 90 degree rotation.

Printing/Plotting with Actual Line Thickness:

The lines of the picture can be printed/plotted either in their actual thicknesses or with thin lines.

Line Width On: The lines are printed or plotted with the actual line width.

Line Width Off: The lines are printed with the smallest width.

Selecting the Interface:

In the *Output To* field you must select the type of interface the plotter or printer is connected to. Your printer manual should be able to provide you with enough information to select either the *RS232* (serial) or the *CENTRONICS* (parallel) interface.

If you cannot determine the correct interface, just try both and then determine which produces the correct output.

> *Note: When using a plotter with a serial interface, make sure that the* ON/OFF *setting is set to* ON.

Zooming:

The output can be enlarged or reduced in size. This does not affect the size of the picture being worked on. The zoom factor can be between 0.01 (reduced to 1/100 size) and 10 (enlarged 10 times).

For example, if the paper size is set to an X value of 300 mm and a Y value of 200 mm, the picture size will have an X value of 100 mm and a Y value of 60 mm. The maximum zoom factor in the X direction is 300/100=3; the maximum zoom factor in the Y direction is 200/60=3.3.

Select the smaller zoom value of 3 so that the whole picture can fit on the page.

Level Colors:

With a color plotter or printer, it is possible to print each level in a different color. The color values can be a value between 0 and 9. Clicking the box increments the color value by one.

Choose Levels:

Only the levels that are currently shown on the screen are printed or plotted.

Setting the Printer Density:

This item is only found in the *PRINTER* menu. You can select any one of the seven boxes. The possible values (points/inch) are selected during the printer installation process. These values are saved in the INS file. Because printing with higher densities takes longer, it is best to print tests in single density.

Starting the Printer or Plotter:

Menu: **File**
Menu Item: **Printer Output**
or
Menu Item: **Plotter Output**

When this is clicked, the printer or plotter starts.

The output can be aborted by pressing any key. If no output appears after selecting this function, check for the following:

- Printer/Plotter not turned on
- Printer not on-line
- Bad connection between Printer/Plotter
- Wrong type of interface was selected

Printing/Plotting Window Contents

With **GFA DRAFT *PLUS*** it is possible to print only a section of the drawing. Create a window and start the printing process and only the contents of that window are printed.

The scale on paper corresponds to the scale of the picture. The setting of picture zoom has no effect on the objects on paper. A setting of 2:1 allows you to select a larger area than 1:1.

> *Note: If the coordinate indicator is set to* Relative, *the actual size of the segment is shown. This is only true for a scale of 1:1.*

If the drawing was created with a scale other than 1:1, you can temporarily set it to 1:1 in order to determine the size of paper needed (but don't forget to change it back after you are finished!).

The INF File

The most important settings that are created during the drawing process are stored in a data file so the settings do not have to be repeated every time you load the drawing.

The file name has the same name as the drawing except that the extension is .INF. This file is saved every time the drawing is saved. If you erase the file by mistake, the picture can still be loaded, but you must reset all the options.

> *Note: If a file is saved because the level is changed then no* INF *file is created. It is only updated when the* Save Image *option is used.*

Using the same name with different extensions for many drawings will result in only one DIF file.

The Saved Parameters

Plotter:	Paper size X,Y Object offset X,Y Zoom factor Speed Colors for levels
Printer:	Paper size X,Y Object offset X,Y Zoom factor Output from/to Colors for levels
Picture:	Inches or mm Colors for level Locking radius
Other:	Hatching angle/distance Path for 3rd character set Lines used to make circle Rotation angle/Zoom factor Move picture/Zoom factor Level

Chapter 10:

Using A RAM Disk

Using A RAM Disk

There are many programs available under the name of RAM disk. These programs simulate a disk drive.

If you do not have a hard disk yet, you will find that it takes a lot of time to load all of the symbols, characters and pictures that are used by **GFA DRAFT *PLUS***. This time can be shortened by using a RAM disk.

Setting up the RAM Disk

Use the instructions with your RAM disk to set up the drive. It is best not to use the RAM disk as Drive C, since this could cause problems with the operating system of your computer.

Once the RAM disk is activated, the memory for **GFA DRAFT *PLUS*** is reduced. Make sure that you leave enough memory for **GFA DRAFT *PLUS***; otherwise there may not be enough memory for storing the picture. You can determine the size needed for the RAM disk by showing the files as text and then adding the file sizes together.

Using the 3rd Character Set

If the 3rd character set is just on disk, it must be reloaded whenever a key is pressed. The loading time is significantly shortened if the 3rd character set is contained in the RAM disk.

You must copy this file to the RAM disk before you start GFA DRAFT *PLUS*.

The *PRESET Marker Pointer Set* contains a field called *Path 3 Character Set.* You must enter the drive and file name, for example: D:\SPECIAL.ASC (drive,file name).

> *Note: If the file name is already shown, you can use the cursor key to move to left of the file name and then enter* D:.

Loading Pictures From RAM Disk

Since all pictures that are not part of the work level are always loaded from the diskette whenever the picture is moved, it pays to put those picture files in the RAM disk.

If those pictures already exist, it is best to copy them to the RAM disk before you execute GFA DRAFT *PLUS*.

When selecting *Choose Level*, you must enter the path in the directory line along with the drive name. Next you must click the top bar in the dialog box. You will now see all the file names of that disk drive displayed. To select a file double click on it.

You can also save your pictures to the RAM disk (for example, whenever the work level is changed). You must, of course, remember to copy those files back to a diskette before turning off the computer.

If the message Disk Full appears, you will have to save the picture to a diskette since there is no more room on the RAM disk to save that picture.

Using Symbols from a RAM Disk

Loading symbols to a RAM disk is the same as above. Make sure you copy the symbol files to the RAM disk before you start **GFA DRAFT *PLUS***. The path must be changed to (D:*.SYM).

Chapter 11:

A Practice Example

A Practice Example

Going through this example should help you to become familiar with GFA DRAFT *PLUS*. A small drawing will be produced from scratch. As many functions as possible are used to demonstrate their effect on the drawing. For this reason the example should not be treated as a guide to optimal working. Later, as an experienced user you will learn to use the efficient GFA DRAFT *PLUS* functions quickly.

Stage I

1. Starting the Program

Start the program by clicking DRAFT.PRG in the window. The name of the file to be read is now expected. Type in a name for the file over the keyboard, in this case TEST1.000. This picture does not yet exist so nothing is read. The name is required later to store the picture. After clicking the OK box we have a blank screen to work with.

2. The Drawing

We want to draw a room complete with furniture. The walls are to be shown as 20cm thick. The room has internal dimensions of 5.50m x 4.20m. In the left wall there is a door 1.20m wide, in the lower wall a window 1.50m wide. In the diskette you will find a symbol containing a frame in DIN A3 format. We will put our object inside that frame.

So the frame will be completely visible, set the zoom factor for the frame to fit within the working window by selecting the *PICTURE Zoom* option and entering a value of 4:1.

The *Mouse Raster* should also be set to 1.0 by entering this value in the *PRESET Cursor* menu. This will simplify the drawing to scale since the cursor will skip over small values.

Loading the frame is accomplished by selecting the *SYMBOL Load* menu. The dialog box will now contain a listing of all symbol files. Clicking the *Frame* folder will list the file DINA3Q.SYM. Select this file and then click the OK box. The symbol will now appear in the working window. It can be moved to the correct position by holding down the left mouse button and moving it to the desired position. Move the frame so that it is centered between the right and left sides leaving more room on the bottom than on the top. The symbol is anchored with a short click of the left mouse button.

3. Choosing the Scale

A scale must be selected so that the drawing will fit within the frame (with some reserve). Measuring the area of the frame, you will find that the difference of the X coordinates is about 400 mm and the difference of the Y coordinates is about 220 mm.

Usable width of frame	400 mm
Usable height of frame	220 mm
Width of room (including walls)	5900 mm
Height of room	4600 mm

The scale is calculated:

X direction: 5900/400 = 14.75
Y direction: 4600/220 = 20.90

In order for the picture to fit in both directions we will have to take the larger of the two. Since we would like to have about a 25% reserve, we will set the scale to 1:25.

This scale must be entered in the *PRESET Image* menu. Erase the value in the dialog box with the ESC key and enter 25. After clicking the OK box, you will now discover that the area of the frame is 10m by 5.60m. The values are shown in meters because any scale larger than 1:10 is always shown in meters.

4. Titling the Picture

It is a good idea to have the scale and the file name on the drawing itself, so we shall write this information in the bottom right corner of the drawing. Change the zoom factor to 1:1, or you will not be able to read the writing. After doing this, move the vertical slider to the bottom where the comment field can be found. Do this by pressing down the left mouse button of the cursor and moving it to the extreme right of the horizontal slider. Repeat this for the vertical slider if

necessary. The text is entered with the keyboard. If the letters are too small, you can enlarge them by selecting *PRESET Market Pointer Set* and choosing a larger size.

5. Drawing the Walls

Before we begin, remember the three ways to delete an object:

- The BACKSPACE key deletes the lines in the reverse order in which they were drawn.
- The DELETE key deletes whatever is nearest to the cursor.
- A window can be placed around an object and in the Window menu the function Delete Contents can be selected.

The UNDO key reverses the latest delete function.

Keep an eye on the mode display in the top right corner of the screen. If you want to end a function, click the right mouse button.

First we are going to draw the walls, doors, and windows. For the outline of the room we want as much of the picture as possible seen in the work window, so go to the *PICTURE* menu and set the zoom factor for the work window to 4.

Moving the cursor, you will discover that the coordinates move in increments of 10 cm because of the *Mouse Raster*. Should you desire to use values smaller than 10 cm, change the *Mouse Raster*.

In order to make it easier to measure with the coordinates, we will set the coordinates to relative by using the *PRESET Cursor* menu. This makes the coordinates relative to the last position clicked.

We shall draw the walls with the item *Draw Rectangle* in the *SPECIAL* menu.

The Right Wall

On the right-hand side of the picture, draw a rectangle that is 0.2m wide (X coordinate) and 4.2m high (Y coordinate). To do this, go to the top right of the work window and click the function *Draw Rectangle*. Press the left mouse button; the coordinates will show zero in the *Relative* mode. Move the cursor down and to the right until the rectangle has the correct dimensions, then click the left mouse button to fix it in place.

The Top Wall

The function *Draw Rectangle* does not have to be selected again as all functions in the *SPECIAL* menu remain active until the right mouse button is clicked. Draw a horizontal bar which has a length of 5.50m + (2 wall thickness) = 5.90m. Release the left mouse button and press it again. The rectangle now sticks to the cursor and it can be placed on top of the right- hand wall. Once in position, fix it with the left mouse button.

The Left Wall

The left wall consists of (as seen from above) a wall of 2.70m, a door of 1.20m (which we shall leave blank to start with) and another wall of 0.30m. We shall draw these parts of the wall in their correct positions.

Position the cursor so that the horizontal crosswire covers the inside of the top wall and the vertical wire covers the left end of the top wall. Now draw a rectangle with the dimensions 2.70m x 0.20m. At the bottom of this rectangle the Y position should be 2.70.

To draw the part of the wall below the door we must add 1.20m for the width of the door. Therefore, the next part of the wall begins at the Y position 3.90m. At the Y position 3.90m line up the vertical crosswire with the edge of the wall above the door and draw a rectangle 0.3m long.

The Bottom Wall

The bottom wall consists of (from the left) a wall of 2.20m, a window of 1.52m and another wall of 2.18m.

First, draw the rectangle for the first part of the wall to the left of the window. To do this place, the horizontal crosswire over the bottom end of the left wall and the vertical crosswire over the outside of the left wall. Now form a rectangle 2.20m long. Then leave 1.50m free for the window and begin again at the X position 3.70m (2.20m + 1.50m) where you should draw a rectangle with a length of 2.20m. The end of the rectangle should coincide with the right wall.

The room may not be at the optimal position. To move the room, go to the *WINDOW* menu and select *Move*. Put a window around the room by pressing the left mouse button and moving the mouse towards the right lower corner. The room can now be moved to the desired position.

Store the picture frequently while working on it so that if you do something drastically wrong you will at least have the picture as it was when last stored. If it should happen that the picture becomes ruined, click *Read Image* in the *FILES* menu. The question Save Current Picture? appears. Click the ABORT box or the ruined picture will be stored. After this, you can reload the picture as it appeared the last time it was saved.

6. Hatching the Walls

First, the proper hatching parameters must be set with the *PRESET Cross Hatch* menu. The distance between hatch lines should be 2 mm, the angle should be 45 degrees and the hatching should be simple. Add these values in the dialog field. The first value is for simple hatching and the second is for cross-hatching. Click the OK box.

There are two possible ways to hatch an area. We will use hatching with *LINES Select*. The other choice will be discussed later.

Choose the *LINES Select* menu and click the inner and outer line of the wall. The lines will now appear dotted. Select the *SPECIAL Hatching* function and the hatching will be performed.

Repeat the process of selecting and hatching for the remaining walls.

7. Drawing the Window

Select the item *Zoom Work Window* from the *PICTURE* menu and set it to 2:1 so you can work on detailed parts of the picture.

Look for the opening left for the window by moving the work window by double clicking the left mouse button. It should be near the bottom middle of the picture. When you have found it move to a nearby space and draw a rectangle 1.50m x 0.05m. Now move the completed window into the space left for it. It should fit exactly. You could have drawn the window in the correct place to start with as with the walls.

8. Drawing the Door

A zoom factor of 1:1 is recommended for this task. Move again with double clicks to the gap we left for the door.

The hinges are to be at the bottom of the gap and on the inside edge of the wall. The door is to be drawn half open to show the radius of the opening.

The door should be 1.20 m wide and 0.03 m thick.

You must change the *Mouse Raster* to 0.25 to be able to draw with a 0.03 m thickness (with the function *PRESET Cursor*). Now draw a horizontal rectangle with above dimensions. Since the door slightly leans to the bottom wall, the rectangle must be rotated. Draw a window around the rectangle and select the item *Rotation in Degrees* from the *WINDOW* menu. A negative value must be entered for the degrees (-10) since the rotation is clockwise. The window can then be moved by holding down the left mouse button. Attach the door to the bottom inside edge of the door frame.

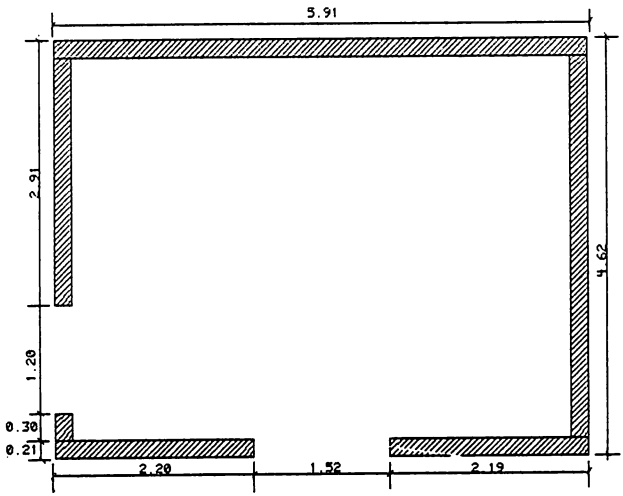
Change the *Mouse Raster* to 1.0.

We now want to draw the door opening radius. For this, we need the item *Circle Segment* in the *SPECIAL* menu. After selecting this function, move the cursor to the point where the hinge is supposed to be, press the left mouse button and hold it down. If the mouse is now moved down and to the right, a circle is formed. Adjust the diameter of the circle until the circle touches the end of the door and the door frame.

Release the cursor and move it so that the vertical crosswire covers the inside of the door frame above the gap and the cursor is in the upper half of the circle preferably on the circle itself. Click once with the left mouse button in this position to define the beginning of the segment. Now the left mouse button must be held down. When the mouse is moved down and to the right, the segment grows. When the segment has reached the door, release the left mouse button and click once to fix the segment. The right mouse button must now be clicked to end the function.

The drawing should now appear as shown in **Figure 24**. The dimensions are given so that the sizes of the individual rectangles are more visible.

Fig. 24



Stage II

We will draw the furniture on a different level. This has the advantage of adding furniture to the room without destroying the drawing.

By pressing the ALTERNATE/CONTROL/F2 key combination, the level can be changed. The current work level will be saved with the name it was given in the beginning. You will then be asked to supply a name for Level 2. In this example, enter TEST.001.

An empty screen will now appear. To add Level 1 (the room), you must click the item *Show Level* in the *PICTURE* menu. This process may take some time since the level that is not active must always be loaded from the diskette whenever the drawing is moved. This is why it is important that the levels are only shown when they are needed.

You are now working with Level 2. Level 1 will not be affected by the functions you select.

1. A Lamp

The Exercise: A standard lamp with a round, conical shade. The shade has a diameter of 0.5m and the opening at the top is 0.16m wide. The lamp is to be hatched (apart from the opening) and labeled.

Set the zoom factor to 1:2 to make it easier to draw these small objects. Set the coordinates to *Distance* so that the radius will be shown while drawing the circle.

First, draw a circle somewhere in the picture. Do this by clicking the *Draw Circle* function in the *SPECIAL* menu and, while holding the left mouse button down, moving the cursor down and to the right. The coordinates show the radius of the circle. The radius of the lamp is 0.25m. The circle is fixed by clicking the left mouse button. In the middle of this circle draw another smaller circle with a radius of 0.08m for the opening. The cursor must be at the right position in order to draw the small circle at exactly the same position as the larger circle. A small dot marks that position.

The lamp must now be hatched leaving the middle circle free. We will now use the second method of hatching possible with GFA DRAFT *PLUS*.

First, select the proper hatching parameters with the *PRESET Cross Hatch* function. The hatching should be done with the double pattern. The first field will contain the value from the last hatching. Set the distance of the second hatching line in the second parameter line. The angle of this hatching line must also be set to -45 degrees.

To start the hatching, select the *Hatching* item in the *SPECIAL* menu. This mode will remain active until the right mouse button is clicked.

After clicking the outer circle, it will appear dotted. A dialog field will also appear that asks you whether or not want that polygon. Just click the OK box. The same thing is repeated for the inner circle. Clicking the inner circle for a second time will perform the hatching functions. This function is terminated by pressing the right mouse button.

> *Note: The hatching can be erased by using the* BACKSPACE *key.*

Now we have to label the lamp. The label is to be within the hatched area but the problem is that it is difficult to read there. Therefore we want to cut a rectangle out of the hatching in which we can place the text.

Click *Cut* in the *WINDOW* menu. This has the effect of cutting all lines at the point where they enter the window and including them in the window operations. If *Extract* had been chosen, only the lines which lie completely in the window would be included in the window operations.

Make a small window in the hatched area where you want to place the text (remember, this is done by pressing the left mouse button and moving down and to the right.) Then the contents of the window can be deleted by selecting *Delete Contents* in the *WINDOW* menu. Now you can go to this free area and type the text using the keyboard.

Set the zoom factor at 4:1 to view the whole room. Move the finished lamp to the desired position. *Show Level* must have been activated.

> ***Note:*** *It is helpful to store all of the objects that you draw (lamps, tables, chairs) as symbols. This is an advantage in that they can be reloaded if they are needed more than once, or if they are spoiled in the drawing.*

A symbol is stored by selecting the *Store Symbol* function in the *SYMBOLS* menu. The name of the symbol must be entered in the dialog field that now appears. This name can contain up to eight characters and must have the extension of .SYM.

Now a function key can be assigned to a symbol: press a function key and then click the name of the symbol to be assigned. Anytime the function key is pressed, the symbol is loaded.

2. A Table and Chairs

The next thing to be placed into the room is a table and four chairs. The table is to be 0.7m x 1.08m and chairs are to have a seat area of 0.4m x 0.4m and have rounded arms.

The coordinates should again be set to *Relative.*

Note: While in the Relative *mode, the coordinates are always set to 0 whenever the mouse button is pressed. This makes it easier to measure real distances.*

The zoom factor of the window should be 1:1 for this job. Draw a rectangle 0.7m x 1.08m. The corners of the table have to be rounded slightly. Use the *Round Corners* function in the *SPECIAL* menu to do this. After selecting this function the radius for the rounding must be entered. As the corners are to be only slightly rounded, enter 3.0mm. Now two lines that form a corner must be clicked. After clicking the second line, the rounding will appear. This can be repeated for all corners of the table because the function continues until the right mouse button is clicked.

Now construct the chairs. Draw the seat area as a square 0.4m x 0.4m. Round the corners with a radius of 4.0mm. The arms are a little more difficult. For these, use the function *Draw Ellipse Segment* in the *SPECIAL* menu. After this has been selected, move the cursor a little to the right of the chair so that the horizontal crosswire runs through the center of the chair. Draw an ellipse which contains in its right half a segment that can be used as an arm. Click the upper point of the segment required. Holding the left mouse button down, move the cursor to the lower point of the segment and click there.

A tip: When drawing complicated objects, copy the individual components (seat, ellipse segments, etc) and keep them to one side of the drawing. If the composition is not satisfactory, it can be deleted and the components put together again.

We now have the segment for the arms. Copy it and place it parallel to the first segment. The upper and lower points of the segment must now be joined with a line. Move the completed arm and place it next to the seat.

Store the chair as a symbol and then reload it four times. Place the chairs around the table. On one side of the table the chairs must be rotated 180 degrees. After reloading, the chair is still in a window. Click *Rotate in Degrees* in the *WINDOW* menu and enter 180 degrees as the angle. After the rotation, the chair can be correctly placed.

5. A Couch

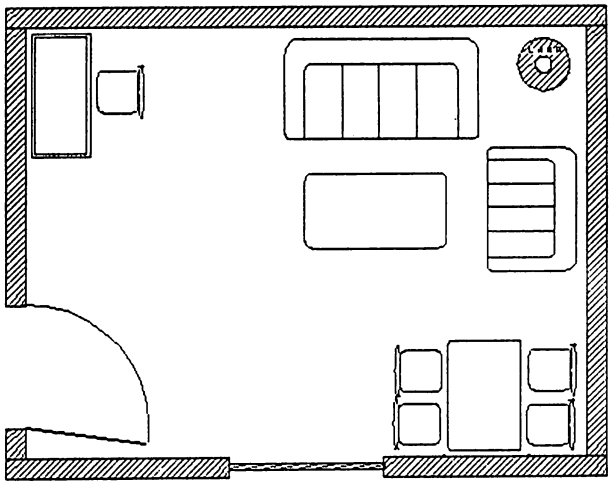
Finally, we'll place a couch in the room. The couch is to be 1m x 1.90m with arms 0.2m wide.

First draw a rectangle that is to represent the total area of the couch (with dimensions 1m x 1.90m). In this rectangle, draw the arms 0.2m away from the ends of the couch. Draw a line across the back of the couch to represent the end of the seat cushions and the beginning of the back cushions 0.25m away from the back.

Now round the corners. In the example, the back corners are rounded with a radius of 10mm, the front corners with 3mm and the inside of the seat cushions with 5mm. To show the individual cushions (or seat elements) switch to *Dashed Lines (Type 2)* under the *Select* function in the *LINES* menu. All lines that are now drawn are dashed. Store this couch as a symbol and place it in the room as desired.

It is easy to make the matching armchairs. Load the couch symbol again and put a window around it. The couch can be squashed until it is an armchair by the mouse with the *Stretch/Compress* function.

Fig. 25



Chapter 12:

Summary of the Functions

The Cursor

Moving the Cursor

With the Mouse: Movement in any direction is possible. Spacing depends on the Mouse Raster setting.

With the Cursor Key: The movement is in the smallest possible steps.

With the ALTERNATE/Cursor Key: The movement is in 8x the smallest possible step.

Preset Cursor

Menu: Preset
Menu Item: Cursor

Cursor Type:

Select between the crosswire or the small cross form to determine how the cursor will appear on the screen.

Coordinate Type:

Absolute: The coordinates are shown relative to the whole picture.

Relative: The coordinates are shown relative to the last clicked point.

Distance: The distance and angle from the last clicked point are shown.

Mouse Raster

The smallest increment the cursor will move using the mouse.

Values: 0.25 0.5 1.0 1.25 2 2.5 4 5

Functions for the Whole Picture

Zooming the Work Window

Menu: Picture
Menu Item: **Zoom Work Window**

This function controls how much of the picture is shown in the work window. Selecting a 4:1 will make all objects appear 1/4 of their normal size. The actual dimensions are not changed.

Values: 8:1 4:1 2:1 1:1 1:2 1:4 1:8

Positioning the Work Window

With the Cursor: Double click with the left mouse button. The current cursor location becomes the center of the new work window.

With the Pointers: The pointer on the scroll bar can be moved by placing the cursor on it and holding down the left mouse button. The position of the pointer along the bar corresponds to the position of the work window in the picture.

With the Scroll Bars: Clicking the scroll bar on one side of the pointer moves the work window block by block in the appropriate direction.

With the Arrows: Clicking one of the arrows on the end of the scroll bars moves the work window by approx. 15mm in the appropriate direction.

Move Picture

Menu: Picture
Menu Item: Move Picture

In a dialogue field the displacement of the whole picture in the X and Y directions can be entered. The displacement is entered in (+/-) mm.

Delete Picture

Menu: **Picture**
Menu Item: **Delete Picture**

Clicking this function deletes the whole picture that is currently in memory. The file on the diskette is not updated.

Free Memory

Menu: **Picture**
Menu Item: **Free Picture Memory**

This shows the percentage of memory still available for the drawing.

Zoom Picture

Menu: **Picture**
Menu Item: **Zoom Picture**

The picture can be zoomed by a factor between 0.01 and 10. The fixed point for this function is the bottom left corner of the picture. The dimensions of the object are changed.

Rotate Picture 90 Degrees

Menu: **Picture**
Menu Item: **Rotate 90 Degrees**

The whole picture is rotated counter-clockwise by 90 degrees.

Select Level

Menu: Picture
Menu Item: Select Level

Assign a level (2 to 10) to the picture file. Clicking a box other than the work level (shown in dark) causes the file dialog box to appear. You can then select the desired level.

Show Levels

Menu: Picture
Menu Item: Show Levels

This selects whether the levels are shown on the screen. Level association remains intact.

Changing the Work Level

To change the work level, press the ALTERNATE/CONTROL keys together with one of the function keys (F1 - F10). The current level will be saved to the disk.

Level Structure

Menu: Preset
Menu Item: Image

Select the color to be used on the monitor for each level. The color value is incremented by clicking the corresponding box.

Preset Image

Scale: The scale can be from 1:1 to 1:1000. Scales higher than 1:10 will show the coordinates in meters (inches). Scales between 1:1 and 1:9 will show them in millimeters (inch/10).

Locking Radius: This is the range that is used to lock the end of a vector. It is important for locking lines or arcs through three points and setting destination points for symbols.

Inches or mm: This sets the scale to millimeters (mm) or inches (in).

Normal or Inverse Switches: This inverses the video display on the screen. When inverted all objects shown light will become dark and all objects shown dark will become light.

Grid: A grid is laid over the picture. Grid spacing can be 1,2,4,5,8,10,16 and 20 mm. It is not printed.

MouseRaster: This sets the grid On or Off.

Deletions

Deleting Vectors/Characters/Symbols

There are three ways of doing this:

With the BACKSPACE Key: Vectors, characters and symbols are deleted in the reverse order to which they were entered. Hatching, circles and symbols are completely erased.

With the DELETE Key: Deletes the vector, character or symbol that is (within a certain range) nearest to the cursor. Whether a circle, hatching or a symbol is completely erased depends on the setting of the menu Object Delete.

With a Window: See **Window Operations**.

Deleting Objects

Menu: Window
Menu Item: Delete Contents

ON: A symbol, circle or ellipse is treated as an entity and is completely erased with the DELETE key.

OFF: It is possible to delete single vectors from an object by pressing the DELETE key.

Canceling a Deletion

UNDO Key: The last deletion can be canceled by pressing the UNDO key.

Characters

Text in the Drawing

Text can be put in the drawing with the keyboard. Characters can be deleted with the BACKSPACE key.

Preset Marker Pointer Set

Menu: Preset
Menu Item: **Marker Pointer Set**

Character Size: The height of a character can be set to one of the following values:

1.25 1.75 2.5 3.5 5 7 10 14

Reflecting Text: Text is shown in mirror image.

Rotating the Text: This allows the direction of the text to be changed. There are four directions to choose from:

0 degrees:	Normal setting
90 degrees:	Text runs from right to left
180 degrees:	Text runs from the top downwards
270 degrees:	Text is read from the left.

Select Character Set: Choose between the two permanent character sets. The third character set can be created by the user.

Path for Third Character Set: You can select the folder and drive from which the third character set is to be loaded.

Characters are symbols with the name of the corresponding key:

A.SYM corresponds to a capital A. A_.SYM corresponds to a lower case a.

Line Functions

Drawing Lines

Define the first point of the line by clicking the left mouse button. Moving the cursor causes a line to be drawn out in the desired length and direction. Clicking the left mouse button again fixes the line. After this, the next line is on the cursor ready to be positioned. If not required, clicking the right mouse button ends the function.

Freehand Drawing

Click the left mouse button once and hold it down. A line is now drawn that follows the movement of the cursor. Releasing the left mouse button ends the line and the right mouse button ends the function.

Preset Lines

Menu: **Preset**
Menu Item: **Lines**

Line Types:

- Solid line
- Dashed line (Type 1)
- Dashed line (Type 2)
- Dotted line

Line Thickness:

The thickness of the line can be set from 0.3mm to 4.5mm.

Construction Lines:

ON: Previously created construction lines are displayed.
OFF: Construction lines are not shown, but they remain intact.

Display Line Thickness:

ON: All lines are shown with their actual thickness.
OFF: All lines are shown as thin lines.

Line Kind:

The line kind is stored internally to be used during the printing of the drawing. There are 8 different line kinds.

Line Locking:

If this is active, the end of the line is automatically joined to the end of the nearest vector. The range at which locking takes place depends on the setting of the *Locking* radius in the *PRESET Picture* menu.

Help Lines

Menu: Lines
Menu Item: Help Lines X
or
Menu Item: Help Lines Y

Each time a point is clicked a horizontal or vertical help line appears. This can be switched off by clicking the right mouse button. Help lines can be deleted by using the DELETE or the BACKSPACE key.

Break Line

Menu: Lines
Menu Item: Break Line

The two lines that are clicked with the left mouse button are broken at the point of intersection. End function with right mouse button.

Trim Lines

Menu: Lines
Menu Item: Trim Lines

The two clicked lines are trimmed to the point at which they intersect. End the function with the right mouse button.

Lines 2 to 1

Menu: Lines
Menu Item: Lines 2 to 1

Two lines that touch are combined into one line. Both lines must be clicked by using the left mouse button. This function is terminated by pressing the right mouse button.

Shortening or Increasing Lines

Menu: Lines
Menu Item: Lengthen

This function allows you to lengthen or shorten an existing line. The direction of the line is not changed.

Move the cursor to the desired line and hold down the left mouse button. The length of the line can now be changed with the mouse. A short click with the left mouse button anchors the line. End this function by pressing the right mouse button.

Parallel Lines

Menu: Lines
Menu Item: Parallel

This function draws a line parallel to an existing line.

Move the cursor to the line that you wish to draw a parallel to. Press and hold the left mouse button. The parallel line can now be moved with the mouse. A short click with the left mouse button will anchor the line. This function is terminated by pressing the right mouse button.

Tangents

Menu: Lines
Menu Item: Tangent

This function draws a tangent to a circle.

Move the cursor to the desired circle and hold down the left mouse button. Both the point at which the tangent contacts the circle and the length of the tangent can be changed by using the mouse. The tangent is anchored by clicking the left mouse button. This function is terminated by pressing the right mouse button.

Selecting

Menu: Lines
Menu Item: Select

Selecting offers two functions:

The Selection of Lines You Wish to Work With: Click the lines that are to be modified using a window with the left mouse button. The last line must be clicked twice. A window is now created. The lines can now be modified using the normal window operations.

The Selection of Lines Whose Inner Area is to be Hatched: Set the parameters for hatching in the *SPECIAL* menu and then select *LINES Select.*

Click the lines whose area is to be hatched with the left mouse button. You must then select the following function:

Menu: Special
Menu Item: Hatching

The hatching is then performed.

Special

All functions in the special menu remain active until the right mouse button is clicked.

Drawing a Circle

Menu:	Special
Menu Item:	Draw Circle

Click the menu item. Press the left mouse button and, while holding it down, move the mouse down and to the right. This causes a window containing a circle to be drawn. When it has the desired radius, release the left mouse button. Pressing the left mouse button for a second time allows you to move the circle to the desired position. Click the left mouse button to fix the circle. If the coordinates are set to *Distance*, the radius of the circle is shown.

Drawing an Ellipse

Menu:	**Special**
Menu Item:	**Draw Ellipse**

Click the menu item. Press the left mouse button and, holding it down, move the mouse down and to the right. This causes a window containing an ellipse to be drawn. When it has the desired form, release the left mouse button. Click the left mouse button to fix the ellipse.

Drawing a Rectangle

Menu: **Special**
Menu Item: **Draw Rectangle**

Click the menu item. Press the left mouse button and, holding it down, move the mouse down and to the right. This causes a rectangle to be drawn. When it has the desired form, release the left mouse button. Click the left mouse button to fix the rectangle.

Drawing a Circle Segment

Menu: **Special**
Menu Item: **Draw Circle Segment**

Click menu item. Press the left mouse button and, holding it down, move the mouse down and to the right. This causes a window containing a circle to be drawn. When it has the desired radius, release the left mouse button. Pressing and holding the left mouse button for a second time allows you to move the segment to the desired position. Click the point on the ellipse where the segment is to begin. Press the left mouse button and hold it down. The segment can now be enlarged clockwise by moving the cursor around the circle. When it is correct, release the left mouse button and click again to fix the segment.

Drawing an Ellipse Segment

Menu: Special
Menu Item: Draw Ellipse Segment

Click the menu item. Press the left mouse button and, holding it down, move the mouse down and to the right. This causes a window containing a circle to be drawn. When it has the desired form, release the left mouse button. Pressing and holding the left mouse button for a second time allows you to move the segment to the desired position. Click the point on the ellipse where the segment is to begin. Press the left mouse button and hold it down. The segment can now be enlarged clockwise by moving the cursor around the ellipse. When it is correct, release the left mouse button and click again to fix the segment.

Corners for Circle

Menu: Preset
Menu Item: Corners to Circle

This function allows you to set the number of vectors that make up a circle. This number must be between 3 and 180. It effects the drawing of circles, ellipses, circle segments and ellipse segments.

Drawing an Arc Through Three Points

Menu: Special
Menu Item: Arc Three Points

Click the menu item and then click three points of the arc. The *Locking* function also works with this function.

Rounding Corners

Menu: Special
Menu Item: Round Corners

The radius is entered in a dialogue field with a range of 1mm to 99mm. Then the two vectors which form the corner to be rounded are clicked with the left mouse button. The vectors are either lengthened or shortened depending on the setting of the rounding radius.

Drawing a Perpendicular Line

Menu: Special
Menu Item: Perpendicular

Click the menu item and then click the line to which a perpendicular is to be drawn. Hold the left mouse button down, and draw the perpendicular to the required length. When it has the correct length, click the mouse again to fix it.

Drawing at a Specific Angle

Menu: Special
Menu Item: Angle to a Line

Click the menu item. The angle is entered as the deviation from the perpendicular. The range is from +90 degrees (counter-clockwise) to -90 degrees (clockwise from the perpendicular). Then the base line is clicked and the line is drawn out at the given angle. When it has the correct length, click again.

Hatching

If desired you can change the preset options for Hatching:

Menu: Preset
Menu Item: Hatching

You may choose between two different types of hatching. The angle and width of hatching can independently be selected for each of the hatching types. The angle can be any value between -90 and +90 degrees (0 grad = horizontal). The width must be between 0.2 an 5 mm.

Starting the Hatching Process:

Menu: **Special**
Menu Item: **Hatching**

Click the menu item. Then, click the lines which form a closed polygon. Clicking a line twice starts the hatching. After each click of a line you are asked if the program should look for other polygons:

OK: The dotted polygon is to be hatched.

MORE: The program should search for another polygon containing this line.

The hatching can be erased by pressing the BACKSPACE key.

Construction Lines

Menu: **Special**
Menu Item: **Construction Lines**

Click the menu item. Go to the line which requires construction lines and press the left mouse button and hold it down. The construction line can then be drawn out from the line. Click the left mouse button to fix the construction line when it is in place. Click the other point on the line where a construction line is to be. The line is drawn here with the same length as the one drawn manually.

Dimensions

The Dimension options can be changed as follows:

Menu: **Preset**
Menu Item: **Dimensions**

Dimension Line Delimiter: The end of the dimension lines can be drawn with an arrow, a bar, or with no delimiter.

Input Manual:

ON: No dimensions are entered.
OFF: The program supplies the dimensions.

Decimal Places: This allows you to select between 0 and 3 decimal places.

Starting Dimension:

Menu: **Special**
Menu Item: **Dimensions**

Click the menu item. Click the two lines between which the dimension is to appear. The dimension line appears between them. Move the cursor to position this line where the dimension is to appear. If the two lines chosen form an angle then the angle between the two lines is shown.

Commands

Start the Commands with the following menu:

Menu: **Special**
Menu Item: **Commands**

Commands Using the Keyboard

Pressing the first letter of the command causes the command line to appear. Input is ended by pressing the RETURN key. Each line may contain many commands separated by a semicolon (;). The following commands are allowed:

MA x,y	(Move Absolute)
MR x,y	(Move Relative)
MP angle, length	(Move Distance)
DA x,y	(Draw Absolute)
DR x,y	(Draw Relative)
DP angle, length	(Draw Distance)

Move: Defining a starting point.

Draw: Draw a line from the last origin to the point defined with the supplied coordinates.

Absolute:	Coordinates are absolute.
Relative:	Coordinates defined from last origin.
Distance:	Coordinates measured in degrees and distance.

PU (Pen-Up) FD or BK Commands: Changes origin. No line is drawn.

PD (Pen-Down) FD or BK Commands: Draws a line.

TT Grad: Sets direction using degrees.

RT Grad (Right Turn): Direction changes the number of degrees to the right.

LT Grad (Left Turn): Direction changes the number of degrees to the left.

FD x (Forward): Draws a line (PD) or changes the position (PU) by length x. The direction corresponds to the currently set angle.

BK x (Backward): Like FD, except line is drawn in opposite direction.

Runtime Variables: Up to ten variables can be used (?0 to ?9) instead of values.

Values are assigned by using the = sign.
?0=5 sets the variable ?0 to 5.

Legal computations characters are: + - / *. Multiple computation may be performed, but they are always performed from left to right.

(?1=?1*2+1 doubles Variable 1 and then adds 1)

Duplicating commands can be repeated by putting the command within parenthesis and preceding it with a number, like *nnn(command)*, where *nnn* can be any number between 1 and 9999.

Altering the Command Line

The UNDO key allows you to recall the last command so that it may be edited or repeated. Editing is performed by using the left and right cursor keys or the BACKSPACE key.

Commands Using a File

Pressing the CONTROL-L key causes the file dialog box to appear. Any file that contains legal commands and has the extension .MAC may be selected.

Saving Commands

Press the CONTROL-S key and enter the file name that you wish to save the command line under.

Entry

The following function simplifies the process of putting text in a drawing:

Menu: **Special**
Menu Item: **Entries**

You may enter up to 16 characters per line. There are two lines. Seven more characters may be

entered but they will be invisible. They may be used at a later time.

Increment: The first number found in the text is incremented by one.

Constant: The text is printed as entered. The size, rotation and mirroring of the text is selected with the PRESET *Marker Pointer Set* dialog box.

After pressing the OK box, press and hold down the left mouse button. The text will appear and can now be moved using the mouse. Fix it by clicking the left mouse button.

Status:

Shows information about objects in the drawing.

Menu: **Special**
Menu Item: **Status**

Click the object with the left mouse button. A field with the corresponding information will be shown on the screen.

Window Operations

General procedure for all operations:

1. Draw window.
2. Choose function(s).
3. Close window.

Drawing a Window

Place the cursor in the top left corner of the area to be enclosed in the window. Press the left mouse button and, holding it down, move the cursor down and to the right. When the window is the correct size release the left mouse button.

Closing a Window

- Clicking the left mouse button confirms the changes made in the window.
- Clicking the right mouse button deletes the window.

Window Operation Applied to Text

Menu: **Window**
Menu Item: **Text**

When this is selected, the window operation is performed on any text present in the window.

Window Operation Applied to Lines

Menu: **Window**
Menu Item: **Lines**

When this is selected, the window operation is performed on any lines present in the window.

Cutting a Vector

Menu: **Window**
Menu Item: **Cut**

When this is selected, vectors that are only partially in the window are cut at the point where they enter. The part of the vector inside the window is included in the window operation.

Extract

Menu: **Window**
Menu Item: **Extract**

When this is selected, only vectors that lie completely within the window are included in the window operation.

Copying Window Contents

Hold the left mouse button down and move the contents of the window to the desired position. The old contents of the window remain unchanged if the following function has been selected:

Menu: **Window**
Menu Item: **Copy**

Moving Window Contents

Hold the left mouse button down and move the contents of the window to the desired position. The following function must be selected:

Menu: **Window**
Menu Item: **Move**

Deleting Window Contents

Menu: **Window**
Menu Item: **Delete Contents**

Deletes the contents of the window.

Zooming Window Contents

Menu: **Window**
Menu Item: **Zoom contents**

Enlargement or reduction of window contents by a factor between 0.01 and 9.99.

Rotate Window Contents by 90 Degrees

Menu: Window
Menu Item: Rotate 90 degrees

The contents of the window are rotated 90 degrees counter-clockwise.

Rotate Window Contents by Degrees

Menu: Window
Menu Item: Rotation in Degrees

The contents of the window are rotated in degrees counter-clockwise by the amount entered (0 to 360 degrees). Negative degrees rotate the window clockwise.

Stretch/Compress Window Contents

Menu: Window
Menu Item: Stretch/Compress

The contents of the window are enlarged or reduced by moving the cursor in the vertical or horizontal directions. The reference point is the lower left corner of the picture.

Skew Window Contents

Menu: Window
Menu Item: Skew

The contents of the window are distorted horizontally by moving the cursor. The reference point is the base of the window.

Reflection

Menu: Window
Menu Item: Reflect in X axis
or
Menu Item: Reflect in Y axis

The contents of the window are reflected around an imaginary axis running through the center of the window.

Working With Symbols

Objects that are used often can be stored as symbols and loaded again when required.

Store Symbol

Menu: **Symbols**
Menu Item: **Store Symbol**

Put a window around the object that is to be a symbol. Click the menu item. For a new symbol, enter its name to replace an existing one, click the name of the symbol in the option box.

Load Symbol

Menu: **Symbols**
Menu Item: **Load Symbol**

Click the menu item. Click the name of the required symbol in the option box. The symbol appears in a window and can be moved to the correct place.

Delete Symbol

Menu: **Symbols**
Menu Item: **Delete Symbol**

Click the menu item. Click the name of the symbol to be deleted in the option box.

Rename Symbol

Menu: **Symbols**
Menu Item: **Rename Symbol**

Click the menu item. Click the name of the symbol to be renamed in the option box. Enter the new name of the symbol in the dialog field.

Symbols on Function Keys

Setting a Function Key:

The symbol must already be stored.

Press the function key. Click the name of the symbol that is to be assigned to this function key. If a function key already has a symbol assigned to it, press SHIFT/Function key to reassign it.

Function Key Status

Menu: **Symbols**
Menu Item: **Function-Key Status**

Fix Point for Symbols

The point within a symbol by which that symbol can be moved to the desired position. Press and hold down the left mouse button and move the symbol to the desired position. Release the mouse button and issue a short click; the symbol will be fixed at the current position.

File Operation

Save Image

Menu: Files
Menu Item: Save Image

The picture in the work level is saved using the same name that was used when it was loaded.

Save Image As

Menu: Files
Menu Item: Save Image As

The picture can be saved with a different file name.

Read Image

Menu: Files
Menu Item: Read Image

You may select a picture from the File Select box to be loaded into the work level. The picture currently in the work level must have been saved or deleted.

Delete File

Menu: Files
Menu Item: Delete File

Select a file for deletion from the file dialog box.

Rename File

Menu: **Files**
Menu Item: **Rename File**

Enter the old file name in one dialog box and enter the new name in the other dialog box.

Printer and Plotter

Presetting of Printer or Plotter

Menu: **Preset**
Menu Item: **Printer**
or
Menu Item: **Plotter**

Paper Size: Enter the actual size of the paper. The X and Y values may be set to any value between 10 and 1299 mm. When using a printer, the X value is the length and the Y value is the width of the page.

Object Offset: The drawing can be moved up to a 199 mm in either the X direction, the Y direction, or both during the print process. However, this will reduce the effective drawing area.

Output From/To (Printer Only): Large drawings are printed on multiple pages. This setting allows you to select the page range from 0-999 that you wish to print.

Plotting Speed (Plotter Only): This setting establishes the plotting speed. It must be a value between 1 and 999 mm/sec.

Rotating the Picture 90 Degrees: Clicking the left symbol will cause the drawing to be rotated by 90 degrees.

Line Width:

ON: Lines are drawn in actual thickness.
OFF: Lines are drawn with the smallest thickness.

Interface: Select whether a *Serial (RS232)* or a Parallel (*Centronics*) interface is to be used. With the *PLOTTER* menu you may also output the drawing to a file on the disk drive.

Zoom Factor: The drawing may be enlarged or reduced by selecting a zoom factor between 0.01 and 10.

Print Density (Printer Only): Depending on your printer, the print density can be printed using seven different resolutions. The left field selects the lowest density. Values are given as dots per inch.

Color Levels: Every dialog field contains the color of a level. By clicking on the desired level, the color can be increased by 1. Values must be between 0 and 9.

Print/Plot Complete Picture

After having set the options with the *PRESET* menu, use the following:

Menu: **Files**
Menu Item: **Printer Output**
or
Menu Item: **Plotter Output**

The output may be cancelled by pressing any key.

Print/Plot Window Contents:

Draw a window around the desired segment and continue as usual.

Choose Levels

All levels except the work level are printed only when the following function is turned on:

Menu: **Picture**
Menu Item: **Show Levels**

Ending the Program

Your session can be ended with the following function:

Menu:	**Files**
Menu Item:	**Quit**

If a modified picture is in the memory that has not yet been saved, a dialog box will ask you whether or not you wish to save it.

Appendix A:

Error Messages

Error Messages

Out of Memory

All of the available memory is used up. The last function was not performed.

Solution: Save the drawing to the diskette. You may then be able to regain some memory by deleting all accessories (extension .ACC) or by deleting the RAM disk.

Object Exceeded Drawing Area

The picture exceeded its legal limits while performing a *Move Picture* or a command function. The operation was not performed. This error will also appear when using *Arc 3 Points* and the circle segment does not fit within the drawing area.

Errors During File Operations

Disk Full

There was not enough room on the diskette for saving the picture.

Solution: Insert another formatted diskette in the drive and save the picture.

File Already Exists

File Not Found

Building of Polygon Not Possible

No lines (or no more lines) were found during the hatching process.

Solution: Pick a different point on the same line. Hatching can also be performed using *LINE Select*, which does not require a polygon.

Printer: Out of Memory

Solution: Reduce color or density

Write Error

A bad entry was made during entering command lines.

Solution: Recall the command line with the UNDO key and correct the entry.

Appendix B:

The Printer and The Plotter

The Parameter Table for the Printer

Printing may be performed in seven different densities. The parameter table contains seven Escape sequences for this purpose. It also contains other parameters. The parameter table can be modified using any text editor. Characters that cannot be printed are replaced with the ^ character followed by the ASCII character plus 64 (for example: ASCII character bell(7) is replaced by ^G (G=71)).

Printer Type: The printer type is printed in the top right corner of the drawing.

Horizontal Density: Escape sequence for horizontal density.

Vertical Density: Escape sequence for vertical density.

Graphic Init2: Second part of the Escape sequence for printer initialization which is performed at the beginning of the output.

Graphic Init: First part of the printer initialization.

Advancement: Number of pins times characters per line.

Horizontal Resolution in Dots per Inch.

Vertical Resolution in Dots per Inch.

Printer Kind: Number of passes and pins. The number of passes is calculated from the vertical resolution and the number of pins.

Dots/Line: Not used.

Number of Colors

Number of Decimal Places

Offset for Graphic Byte (When using 7 bit data on some printers)

Printer Type:

0 = *Epson* and *IBM* compatible
1 = *Microline*
2 = *Oki* color printer
3 = *Oki* color printer in *Microline* mode
4 = *HP Laserjet+*, etc.

Return to ASCII: This Escape sequence is passed to the printer after completing the drawing to set the printer back to ASCII mode.

Graphic End: The Escape sequence to turn the graphic mode ON or OFF for printers like *Oki, Itho*, etc.

Linefeed Terminate: Advances the line with an ESC A.

Color Selection: This Escape sequence turns the color on.

Binary:

0 = Numbers are represented in binary format.
1 = Numbers are represented in BCD format.

Paper Size in mm: Since most new printers are very similar, it is usually possible to change this parameter table by selecting the closest printer and modifying just a few of the options. Adjusting drivers for older printers may be harder and should not be performed by the user.

Plotter Installation

Plotter Name: 8 characters. It appears in the menu line during plotting.

Initialize 1: Maximum of 12 characters. These characters, along with Initialize 2 and 3, are sent to the plotter at the beginning.

Initialize 2: See *Initialize 1*.

Reset Plotter: These characters are sent to the plotter when finished with the drawing.

Paper Size X: Paper width in mm. Can be changed by using *PRESET Plotter*.

Paper Size Y: Paper height in mm. Can be changed by using *PRESET Plotter*.

Resolution: Resolution of plotter in steps per mm.

Maximum Colors: Maximum number of color pens.

Pen Selection: Plotter command for selecting pen.

Draw: Plotter command for drawing a line.

Move: Plotter command to move pen.

Delimiter Character: Character that separates parameters (usually a comma or space).

End Character: Character that terminates a command (usually RETURN ^M).

Perform Draw: Execution of *Draw* after issuing command (only used by a few plotters).

Perform Move: Execution of *Move* after issuing command (only used by a few plotters).

Line Type: Command for selecting line types.

- Solid lines: Code for solid lines.
- Short dashes: Code for short dashes.
- Long dashes: Code for long dashes.
- Dotted lines: Code for dotted lines.

Initialize 3: See *Initialize 1*.

Exchange X and Y: This character will switch the X and Y parameters during plotting (used by some plotters like the *Kyocers-Lazer*).

Plotter Speed: Command for setting the speed at which the pen will move (the speed can be set using *PRESET Plotter*).

Appendix C:

The LIST Program

The LIST Program

The LIST program creates a file from the picture file that can be used by other programs (such as programs written by the user). The information retrieved from the picture data is similar to the data that is shown with the *Status* mode. The dialog box of the LIST program allows you to turn the following objects on or off:

1. **Line**
2. **Symbol**
3. **Input**
4. **Rectangle**
5. **Circle**
6. **Dimensions**

The following dialogs allow you to choose the data that you wish to include in the output file.

1. Line

Kind:	5 positions, installed with GFADRAFT.INS.
Angle:	Angle of the line in degrees.
Length:	Length of the line in mm.
X Pos:	X Position, start of line.
Y Pos:	Y Position, start of line.

2. Symbol

Name:	Name of the symbol as it appears on the diskette.
Subsym:	Number of sub-symbols.

3. Input

Invisible Input:	The invisible value as entered with *Entry* dialog.
Input1:	Upper line of picture data.
Input2:	Lower line of picture data.
X Pos,Y Pos:	Left bottom corner of the Input1 line.

4. Rectangle

X Width:	Length of the X border.
Y Height:	Length of the Y border.
X Pos, Y Pos:	Left bottom corner of the rectangle.

5. Circle

Corners:	Number of corners.
Radius:	Radius of the circle in mm.
X Pos, Y Pos:	Center point of circle.

6. Dimensions

Scale:	Corresponds to the scale of the picture.
X Pos, Y Pos:	Lower left corner of the scale.

Program FORMLIST

The LIST program sorts and formats ASCII lists. These ASCII lists were created from the picture files. The LIST program creates a data file from the picture that has an extension of EXP, like TEST.EXP. By using the FORMLIST program, a further list from this data can be created. This list can be defined through the file FORMLIST.INF or TEST.IF2 if that file is present.

Selecting the output to disk causes the listing to be saved under the file name TEST.FRM. Selecting CENTR causes the output to be printed to the printer.

Setup of file FORMLIST.INF (control characters 0-31 may be represented by using ^& to ^_):

Line

1. **Printer Start**
   Is printed at the beginning.

2. **Printer End**
   Is printed at the end.

3. **Reserve**

4. **Reserve**

5. **Reserve**

6. **Left Limit**
   Character sequence that is given at the start of a line.

7. **Total Sum**
   Line is printed below the list and contains value of the sum column.

8. **Title Line**
   Is printed at the beginning of the list.

9. **Insert Line**
   Character that makes up the text between the lines.

10. **Number of Columns from 1 to 20**

11. Reserve

12. Length of the First Column

13. Title of the First Column

14. Limits of the First Column
    Taken from the data file; created with the LIST program or from FORMLIST.

15. Source 1 to 3 as Follows:

    1 - Display position. Running numbering of lines.
    2 - Quantity column. Shows quantity of similar data sets
    3 - Sum column. Shows the sum from quantity and one data column.

16. Reference to X Column
    Points to a column defined as -2 or -3 (otherwise it is set to 0). With -2 the column containing the chain element of the similar data set is shown. With -3 the column that contains the end value of the sum column is shown.

17. Length of the Second Column

18. Title of the Second Column

19. Limits of the Second Column

20. Source of Second Column

21. Reference of the X Column

etc.

Index

Angle to a Line function 66, 170
Angles for Commands 108
Arc Through Three Points function 64, 169
Arrow Boxes 32
BK x (Backward) Command 114, 174
Characters
Definition 160
Character Size 42, 159
Character Sets (See *Marker Pointer Set*)
Choose Levels 124
Changing the Work Level 103, 156
Circles and Ellipses 61
Drawing a Circle 144, 166
Drawing a Circle Segment 63, 167
Vectors for Circle 64
Corners for Circle 168
Tangents to a Circle 68
Drawing an Ellipse 166
Drawing an Ellipse Segment 63, 147, 168
Commands 107, 113, 173
Commands Using a File 175
Commands Using the Keyboard 173
Using Commands from Disk 116
Altering the Command Line 111, 175
Chaining Commands 112
Duplicating Commands 112
Input of Commands 109
Saving Commands 116, 175
Constant Entry 80, 176
Coordinates: 27, 153
Absolute 107, 173
Distance 108, 173
Relative 107, 108, 173
Cursor 25, 33, 152
Form 26, 152
Movement 28, 152
PRESET Cursor menu 152
Cut option 52, 145
Decimal Places 172
Delete Functions 90, 91
Delete Contents 146
Delete File 184
Delete Picture 92, 155
Canceling or Undoing a Deletion 91, 159
Deleting Vectors/Characters/Symbols/Objects 158, 182

Designing with a Computer 5
Dialog Fields 23
Dimensions 77, 172
Dimension Line Delimiter 77, 79, 172
Draw command 107, 173
Drawing Freehand 34, 160
Ending the Program 47, 188
Entry 79, 175
(See also: *Constant, Increment,* and *Invisible Text Box*)
Error Messages 190
Extract option 52, 145, 178
FD x (Forward) Command 113, 174
Files 12-13, 19, 184-5
FORMLIST Program 202
Function Keys 87, 183
GEM Desktop 8, 9, 10
GFA OBJECT 116
Grid 97, 157
Hatching Function 69, 145, 170
Hatching with *LINE Selection* 74
PRESET Cross Hatch function 70, 145
Help Lines in X and Y Direction 99
Improvements to GFA DRAFT 2
Inches or Millimeters 96, 157
Increment Entry 80, 176
INF File 126
Input Cursor Offset (See *Mouse Raster*)
Input Manual 172
Interface 123
Inverse Switch 96, 157
Invisible Text Dialog Box 80
Lengthen Function 68
Level Colors 103, 124
Level Structure 156
Working on Several Levels 100
Selecting Level 101, 156
Show Levels 102, 144, 156
LINES menu 148
Line Functions 160
Presetting Lines 99, 36, 161
Line Thickness 38, 123, 161
Line Types 37, 38 161, 162
Selecting Lines 70, 165
Shortening or Increasing Lines 36, 163
Trimming Lines 40, 163
Break Line function 39, 162
Line 2 to 1 function 39, 163

Locking Lines 35, 63, 97, 162
Construction Lines 75, 161, 171
Values of Construction and Dimension Lines 79
Help Lines 162
Parallel Lines 67, 164
Perpendicular Lines 66, 169
Tangent Lines 164
Window Operations Applied to Lines 57, 178
LIST Program 200
Locking Radius 157
LT Grad (Left Turn) Command 113, 174
Marker Pointer Set 42, 44, 159
Selecting the Character Set 160
The 3rd Character Set (Path 3) 45, 130, 160
Memory 99, 155
Menus 8
Selecting Items 22
Switching Items ON/OFF 23
Mode Display 25
Mouse 8
Mouse Raster 27, 153, 157
Move Command 107, 173
Moving the Whole Picture 97
PD (Pen-Down) Command 113, 174
PU (Pen-Up) Command 113, 174
PRESET Image 94, 157
Printer and Plotter 185
Menu 118
Installation 118, 197
Plotting Speed 123
Setting the Printer Density 125
Parameter Table for Printer 194
Printout From/To
Printing/Plotting Window Contents 125
Printing/Plotting Line Thickness 123
Starting the Printer/Plotter 125
RAM Disk 130-132
Read Image 13, 184
Directory Line 15
Directory Window 15
Input Line 16
Rectangle Function 61, 167
Reflection 181
Rotating:
Rotation in Degrees 141, 148
Rotating Window Contents 55
Rotating the Picture 90 Degrees 98, 123, 155
Rotating Text 159

Rounding Corners 65, 147
Runtime Variables for Commands 112, 174
RT Grad (Right Turn) Command 113, 174
Scale 95
Scroll Bars 32
Security Copy 10
Showing the Image 96
Skew Window Contents 56
SONDER.ASC 45
Starting the Operating System 9
Starting the Program 13, 134
Status 100, 176
.SYM extension 146
Stretch/Compress function 56, 149
Symbols 146, 183
  Definition 84
  Creating Symbols 84
  Deleting Symbols 86
  Function Keys 87
  Loading Symbols 85, 182
  Modifying Symbols 88
  Moving Symbols 88
  Renaming Symbols 86, 183
  Store Symbol function 146
Tangents 68, 164 (See also *Circles* and *Lines*)
Text 41, 51, 159
  Setting the Direction of the Text 43
  Reflecting Text 43, 159
  Window Operation Applied to Text 177
Three Command Sequence Remarks 110
Titling the Picture 41, 136 (See also *Text*)
TT grad Command 113, 174
Vectors: See *Circles* and *Lines*
  Cutting Vectors 178
Windows 50, 51, 52, 177
  Definition 50
  Window Operations 177
  Closing a Window 52, 177
  Copying Window Contents 179
  Deleting Window Contents 179
  Moving Window Contents 53, 179
  Printing/Plotting Window Contents 125
  Reflecting Window Contents 56
  Rotating Window Contents by Degrees 180
  Skewing Window Contents 56, 181

Stretching/Compressing Window Contents 56, 180
Zooming Window Contents 54, 179
Work Window 31, 153, 154
Zooming 124
Picture 29, 98
Window Contents 54
Work Window 153

Notes

Notes

Notes

Notes

Notes

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